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Grapes and wines..

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GRAPES AND WINES FROM HOME VINEYARDS





Grapes and Wines

FROM HOME VINEYARDS



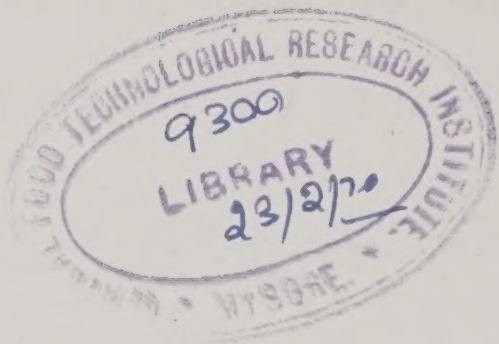
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CFTRI-MYSORE



9300
Grapes and wines.

PRINTED IN THE UNITED STATES OF AMERICA

To my dear friend
RUDOLPH J. ANDERSON
Grape-grower and wine-maker
par excellence



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¶§ The figures throughout the text were drawn by ELSE BOSTELMANN, the decorations and jacket by JULIAN BRAZELTON. Format by JOHN BEGG.

Preface

PERHAPS a thousand books on grapes and wines could be collected, at least a hundred of which have been written by American authors. General and technical treatises without number discuss grapes and wines. Bulletins and magazine articles enlarge the world's literature on this favorite fruit and its product, wine. Why add another book?

Methods of growing grapes change, and new varieties appear every year. In America, a good many people are learning to make wines and want information about the art. Nearly all that has been written in this country is for professionals—for people who toil for money. The present author is writing for amateurs—those who toil for joy.

Go where you will in the garden lands of this continent, one sees plantations of grapes whatever the climate or the soil. Very often these vineyards are pathetic efforts; but, taken together, they tell of the universal love of this fruit and bespeak the desire to grow grapes against all odds. This text takes particular note of the troubles of home vineyardists who may be working under handicaps of one kind or another.

Millions of Europeans make wines in their homes. Wine is the chief homemade beverage of most of Europe. Can Americans make wines in their homes? They did through Prohibition and had that episode in our national history continued we might now be a wine-drinking people. A writer in *Fortune*, for September 1943, says that 150,000,000 gallons of basement wine were made in America per year during Prohibition and that 30,000,000 gallons are being made per year now. The chief aim of this book is to

help the makers of 30,000,000 gallons of basement wine to make a sound, wholesome beverage.

The author has been guided by growers of grapes for more than fifty years. To name those in every part of America to whom he is indebted for knowledge is impossible. For nearly fifty years, too, he has been having friendly adventures with wine-makers, amateurs and professionals of many degrees of wine wisdom. He must acknowledge his indebtedness to a few of these whose counsel, wise books, and delectable bottles have been his companions in the magic country of wine.

First to be named is Dr. Rudolph J. Anderson, a member of the faculty of Yale University, to whom this book is dedicated. During the long years of the great drouth of Prohibition we were fellow students in the gentle art of making wine—he as a chemist, the author as a horticulturist. In the same breath must be mentioned Dr. Selden Rose, another member of the faculty of Yale University, author of *Wine Making for the Amateur* (published privately by Bacchus Club of New Haven in 1930). With these two the author has enjoyed many feasts of wisdom and many fine wines.

Next must be mentioned Mr. Philip M. Wagner, Mr. Tom Marvel, and Mr. Henry Chapin. Philip Wagner is editor of *The Evening Sun of Baltimore* and author of *American Wines and How to Make Them*, and *Wine Grapes*, two superlatively good books. Tom Marvel is a member of the firm of Frank Schoonmaker and Company, Inc., of New York City, a writer on wines for papers and magazines, and joint author with Mr. Frank Schoonmaker of *The Complete Wine Book*, by far the best book published in America on the wines of the world. Mr. Henry Chapin is an author with two books of poetry to his credit, and was the joint editor, with Mr. Peyton Boswell, of *Wine and Good Living*, an admirable though short-lived magazine. These three men have long had an interest in the fermented juice of the grape, are connoisseurs of the world's wines, and past-masters of the Art of Good Living. More than a few times the author has enjoyed with one or another of them a procession of American-

made wines. They have been guides and friends whose experience in wine-making has been most helpful.

Especial acknowledgments must be made to Mr. Harold G. Beattie and Dr. George J. Hucker of the New York State Experiment Station, at Geneva, both of whom read the manuscript of the first six chapters of Part II to make corrections and suggestions in the chemistry and bacteriology of wine-making. The author is greatly indebted to several other members of the staff of the Geneva Station for illustrations. Photographs for plates VII, VIII, and XXI were furnished by the Soil Conservation Service of the U. S. Dept. of Agriculture; photographs for plates X, XXIII, and XXIV were furnished by Professor A. J. Winkler, of the College of Agriculture, University of California; the photograph for plate IX was furnished by H. P. Stuckey, director of the Georgia Experiment Station; for all of which the author wishes to acknowledge his indebtedness.

Grapes and Wines from Home Vineyards is a by-product of a life-long experience in viticulture. If, in coming toward the finish of this experience, the author can introduce any considerable number of his fellow Americans to grape-growing and wine-making, he will feel that he has been rewarded.

U. P. HEDRICK

Geneva, New York

PART I

THE HOME VINEYARD



I. Cultivated Grapes

THE grape that Noah planted after the Flood was *Vitis vinifera*, the wild and cultivated grape of the Old World. This is the grape so often mentioned in the Bible; it is the grape of the myths, fables, and poetry of all peoples; it is the grape from which most of the wines and all the raisins in the world are made; it is the grape of all grape-growing regions of the world, excepting only the part of the United States lying east of the Rocky Mountains. This grape is the most important agricultural crop in southern Europe and northern Africa, and is largely grown in vast regions in other parts of the world, having followed civilized man from place to place in all temperate climates. When one speaks of the grape or of the vine, it is the Old World grape, *Vitis vinifera*, the vine of antiquity, that presents itself. From it have been developed several thousand varieties of cultivated grapes.

The Old World grape was brought by the Spaniards to Mexico, and later to what is now New Mexico, Arizona, and California. When the English established colonies on the Atlantic seaboard, they brought this grape with them and planted it in the provinces of Massachusetts, New York, Pennsylvania, Virginia, the Carolinas, and Georgia, and tried for two hundred years to grow it, without success. Though North America is a natural vineyard, in which twenty or more wild species grow east of the Rocky Mountains, the Vinifera grape of the Eastern Hemisphere grows well on this continent only in California.

Still, as we shall see in future chapters, the Old World grape plays a most important part in the viticulture of all parts of the New World. From its varieties at least 90 per cent of American

wines are made, all the raisins of this continent, and fresh grapes of one or another of its offspring are found the year around in the markets of the country. More important to this discussion, it is a parent of many hybrid grapes grown in eastern America, every breeder of grapes in this region having sought to introduce some of the characters of this species in his new varieties. Since *Vitis vinifera* is the foundation of American viticulture, it must be considered first in a discussion of cultivated grapes.

VITIS VINIFERA, THE OLD WORLD GRAPE

There is no question but that primitive Europeans began the cultivation of the grape several thousand years ago. It grows wild in all the temperate parts of the Eastern Hemisphere; and, to early man, it must have seemed about the best of the forest fruits. Sooner or later the first men cultivating the soil planted grape vines near their dwelling places, and vineyards came into being. By the time the grand old Roman statesmen and farmers, Cato and Varro, the two Plinys, Roman naturalists, and the bucolic poets, Virgil and Columella, began to write, grape-growing and wine-making were the most important industries in the Roman Empire.

These old writers mention many varieties of grapes under cultivation in their day, just before and just after Christ's time. One sees at once how varieties originated; some men like green grapes; others those with red fruit; some like sweet, others tart grapes; for some purposes, early grapes, and for others, late grapes are wanted; and, to be sure, every grape-grower finds uses for a variety of kinds. On some soils the vines are vigorous; on others, dwarf types grow best. So on, through the centuries, there has come into being a great number of varieties, each with distinct characters.

During the long era in which Rome was queen of land and sea, the grape was taken to every part of the Empire where it could be cultivated. Its culture spread from India on the east to France on the west. The fruits were a table delicacy in all the Roman provinces for three or four months of the year, and wine was on nearly every table. Raisins and Corinth currants—small raisins—kept the



PLATE I. *Vitis vinifera*



PLATE II. *Vitis Labrusca*

grape in use the year round. There was, one knows from old records, a continuous interchange of information between the countries of the Roman Empire regarding the kinds of grapes, the care of vineyards, and methods of making wines.

In the last two or three centuries, culture of the Old World grape has spread from southern Europe, southwestern Asia, and northern Africa to southern Africa, Australia, New Zealand, temperate parts of South America, and to California, to name only the parts of the world where the grape is a major crop and wine-making a major industry. The trade in table grapes, wines, raisins, and dried currants from the Corinth grape represents many thousands of acres of vineyards, employment for many thousands of people, and many millions of dollars invested in stored wines.

Colonizers in all the early settlements in North America, taking note of the wild grapes, planted vineyards. They had been wine drinkers in Europe, and desire was strong for this product of grapes in their new home. To them, only the grape of the Old World was worth planting. In the two hundred years after Jamestown was settled, shipment after shipment of vines of the European grape were planted from Maine to Florida, without a single marked success in growing this fruit. Many of the experiments were on a large scale and in the hands of expert viticulturists, yet all failed.

For more than two centuries the causes of the failures in growing the Old World grape in eastern America were a mystery. Grape-growers now know that a tiny insect, the phylloxera, was the chief source of trouble. This insect does little injury to American wild grapes, but on the roots and leaves of the European vine it quickly destroys the plant. There are also three fungi that are very injurious to the European vines in America: these are, black-rot, downy-mildew, and powdery-mildew.

Finally, the imported grape cannot endure the cold winters or the hot summers of eastern America. *Vinifera* grapes can be grown east of the Rocky Mountains, in the northern states, only when the plants are covered to protect them against the cold. The thin, much expanded leaves and the tender-skinned grapes

scorch in the southern states, so that their culture in the South is impossible; there is no way to protect the vines from the hot sun.

Why are Old World grapes superior to those of the New World? The vines of *Vitis vinifera* are, in its cultured varieties, easy to train, and very productive. Its varieties, in one group or another, are adapted to many soils. The vines are easily propagated from cuttings, and easily grafted both indoors and in the field. The varieties of this species produce grapes with a higher sugar content than do most of those from American species; hence the grapes are better adapted for making both wine and raisins; and they keep and ship better. Most of the Old World varieties have a more delicate and a richer flavor and a more agreeable aroma. They lack the obnoxious foxy odor and taste of many American varieties and are not so sour. The bunches of the foreign grapes are larger and handsomer; the skins of the berries are edible, which they are not in native kinds; and the seeds are not as objectionable as they are in our Concords, Delawares, Clintons, and their relatives.

Vitis vinifera is a most variable species, but its chief botanical characters are readily set forth as follows:

Vines variable in vigor, not so high climbing as most American wild grapes. Tendrils intermittent. Leaves round—cordate, thin, rather smooth, more or less deeply three- five- or seven-lobed. While usually smooth and shining, the leaves and young shoots may be downy and even hairy; lobes rounded or pointed, teeth variable; the petiole is set in a deep, narrow notch or sinus. The grapes are exceedingly variable in size and color, ranging from a quarter-inch in diameter in the little Corinth-raisin grape to more than an inch in many varieties; the berries may be either round or oval, while those of American species are always round or nearly so. The skins adhere to the flesh and are always edible, whereas the skins of American species slip from the pulp and are inedible. The flowers are typical of the genus *Vitis*. The roots

are large, soft, and spongy. The characters of the leaves and shoots and tendrils are shown in Plate I.

WILD GRAPES IN NORTH AMERICA

Early settlers in eastern America found wild grapes growing in the warm, dry soils of New England; in the woods and on the sea plains of the Atlantic and Gulf states; running riot in the rich lands about the Great Lakes; in all parts of the Mississippi Valley; flourishing in the limestone hills of the Allegheny Mountains; on the Great Plains, especially in Oklahoma and Texas; and several species in the states of the Rocky Mountains and the Pacific Coast. In every part of America where any of the hardy tree-fruits grow, some wild grape was found.

The vines of American wild grapes are as different as the environments in which they grow. Those in forests grow to tree tops for light and sun, and may have either slender, graceful trunks, or stout tree-like stems that in old age may become a foot in diameter. One species, *Vitis rupestris*, growing in rocky soils, is a dwarf scrub. The southern Scuppernong runs on the ground or on fences and clammers over bushes and tall trees, sending down aerial roots to make a multiple plant. All are deciduous, but some are nearly evergreen. Vineyardists have many kinds of plants from which to choose, and may train them to the shape they like best. No other cultivated fruit has plants with such diverse forms and offers so great a choice in training under cultivation.

That grape-growing in America must depend on native wild grapes began to be recognized at the end of the eighteenth century, when a good variety of the wild Fox grapes, the Alexander, came under cultivation. Thomas Jefferson, writing in 1809 to John Adlum, an early experimenter with American grapes, said of the Alexander, 'I think it will be well to push the culture of this grape without losing time and effort in the search of foreign vines which it will take centuries to adapt to our soil and climate.' These Fox grapes, as we shall see, play a most important part in the history of viticulture in America. The Alexander was found

growing wild near Philadelphia by John Alexander, gardener to William Penn, and was given his name, though he introduced it as the 'Cape' with a false statement that it was a variety of the European grape brought from the Cape of Good Hope.

VITIS LABRUSCA, THE FOX GRAPE

No less than five hundred cultivated American grapes are in part descendants of this species, all having originated since the Alexander was recognized. There are several reasons why Labrusca grapes are more commonly cultivated than those of any other native species. The grapes of *Vitis Labrusca*, either wild or cultivated, are larger and handsomer in bunch and berry than in other native species; among all wild grapes this one alone has black, white, and red grapes; all in all, the flavor of the Labruscas is rather better than that of other wild grapes; there are northern and southern types growing on a great variety of soils, so that cultivated Labruscas are adapted to a wide range of conditions; lastly, this wild grape is most common to the parts of the continent in which gardens and orchards were first planted.

Cultivated Labruscas, however, are not without faults. Most of the varieties have a peculiar aroma, which, to those accustomed to European grapes, is disagreeable, and because of which few pure-bred Labruscas are suitable for wine-making. Concord and Niagara have this foxy odor, and all the perfumes of Arabia could not wholly disguise it. The grapes of this species are lacking in sugar and acid, both necessary in making wines. One eats the skins and often the seeds of European grapes, but the fastidious eject both in eating the Labruscas. Though millions of Americans eat Concord, Niagara, and similar varieties with pleasure, few epicures rate them high in quality and none care for wines made from them.

Pure-blooded Labruscas are easily distinguished. The vines run or clamber forty feet with much heavy foliage; they are vigorous, healthy, and long lived. The leaves are large, thick, dark green and smooth above, with much rusty or reddish pubescence beneath; broadly cordate or ovate; three-lobed toward the apex. (See Plate

ii.) The bunches are large, compact, and often shouldered. The berries are large, purple-black, red, or green, usually with heavy bloom. The skins are thick and separate from the pulp—the ‘slip-skins’ of common parlance. Usually there are four rather large seeds, which are objectionable in eating. And then, of course, there is the foxy odor which pervades the atmosphere wherever they are: the vineyard, a building, a room, a bunch of grapes, or a bottle of wine. ‘Foxiness,’ as applied to this and other species, designates a strong musky odor supposed to resemble that given off by a fox.

The vines are hardy as far north as the peach can be grown and thrive in many soils, though they grow best on warm gravels or shales, which are loose and well drained. Nearly all varieties having *Labrusca* blood fail on soils having much limestone, manifested in a few years by yellow leaves, a disease to which the name ‘chlorosis’ has been given. The roots are soft and fleshy and rather susceptible to phylloxera. All *Labruscas* are easily propagated from cuttings; all are easy to manage in the vineyard; all are productive—a little more so than any other native grape. Unfortunately, the berries of most *Labruscas* drop badly when ripe and do not keep well in storage.

The best known pure-blooded varieties of *Vitis Labrusca* are Concord, Niagara, Worden, Moore Early, Lucile, and Wyoming, all having so much of the foxy odor and taste of the species that none can be said to have high quality to eat out of hand; and from none can good wines be made. There are many good table- and wine-grapes, however, that have some *Labrusca* blood. The best of these are Catawba, Diana, Iona, Dutchess, Eumelan, and Ives. Were these several varieties easy to grow, eastern America would have excellent grapes for red and white wines. All, however, are shameless coquettes in the vineyard, and only epicures of wine will flirt with them. White wines from *Labrusca* grapes are usually better than red wines, because they are not fermented on the skins, in which most of the foxy odor resides; nevertheless, the best red wine the author ever made was a blend of a hogs-

head of Iona and another of Ives, both fermented on the skins, the first pink in color, the latter a deep red, the combination a light-red wine of delectable taste and aroma.

VITIS AESTIVALIS, THE SUMMER GRAPE

The second most important American wild grape is *Vitis aestivalis*, the Summer grape. This is pre-eminently the species from which to make wines, white or red, dry or sweet, from the vineyards of eastern America. *Aestivalis* grapes grow wild from New England to Florida and westward to the Mississippi and Texas. In all parts of this great region where fruits grow, some variety of this species can be grown in gardens, if not in commercial vineyards. The varieties of *V. aestivalis* are easily distinguished whether by vine, leaf, or fruit. Even the roots are characteristic, being so hard and running so deep in the soil that they not only have a distinctive appearance, but, of greater value, are highly resistant to phylloxera. So, too, they penetrate almost any soil and are not so averse to lime as other native grapes.

The vines are very vigorous, long, and rather slender. The leaves are medium to very large, rather thin, three- to five-lobed; the upper surface is dark green, the lower surface with reddish or rusty pubescence. (See Plate III.) The bunches are medium to large, not much branched, with long stems. The berries are small, glossy black, with little or no bloom. The grapes have a tart taste but contain more sugar than most other wild grapes, especially having more than the sweeter tasting *Labruscas*. In most varieties, the berries have little pulp; thin, tough skins; and a spicy flavor. All grapes of this species are rich in red coloring matter, which makes their must useful to blend with that of other grapes to produce a richly colored red wine.

Norton, the typical variety of this species, though it may have a touch of other blood, is the best of all eastern grapes for red wines. When fully ripe it is very pleasant to eat out of hand, though the berries are small and a little seedy. Unfortunately it can seldom be ripened north of the Potomac, is hard to propagate from cuttings or grafts, and is not easily transplanted. It is



PLATE III. *Vitis aestivalis*



PLATE IV. *Vitis vulpina*



PLATE V. *Vitis rotundifolia*



PLATE VI. *Vitis rupestris*

too bad that plant-breeders have not used Norton more in hybridization. Crossed with Delaware, or some other good wine grape, it might easily become a parent of an ideal American wine grape.

There are two sub-species of *Aestivalis*. The more important in viticulture is the botanical variety *Bourquiniana*. It differs from the type species in having thinner leaves, with less red in the pubescence on the underside, and in having amber as well as black berries, which are larger, sweeter, and juicier. To this sub-species belong *Herbemont* and *Lenoir* of the South; and, in part at least, *Delaware*, in the North, standard in quality of all American table grapes, and much grown for making white wines. *Bourquiniana* grapes thrive in many soils; but, at best, the yield is so small that the variety is an expensive luxury for the wine-maker. *Herbemont* and *Lenoir* are very good wine grapes for the South, though, unfortunately, less and less grown. Both are esteemed for wine-making in France.

This sub-species is not to be found in the wild state, which has led to voluminous discussions and much naming and renaming by species makers. It is thought by some to be a native of Europe, brought to America by the Bourquin family of Georgia, whence the name. The writer, who has grown many pure-bred seedlings of its varieties and many hybrids as well, is of the opinion that it is a hybrid between the Old World grape, of which it possesses many characters, and a native species.

The other sub-species is the botanical variety *Lincecumii* (by some spelled *Linsecomii* and sometimes considered a species). This is the Post-oak grape of Texas, brought under cultivation by the late T. V. Munson, Denison, Texas. Munson hybridized varieties of this grape with those of several other species, and thereby originated a large number of excellent table and wine grapes. These are at their best in the South and Southwest, but a few of them grow very well in northern grape regions. *America*, *Bailey*, *Beacon*, *Champanel*, and *Fern* Munson are, perhaps, the most typical of Munson's Post-oak grape hybrids. All have highly

colored juice; none has any foxiness in flavor or aroma; all have a high sugar content; all are promising for red wines.

Most of the varieties of *Vitis aestivalis* thrive on lighter and shallower soils than do those of any other American species; they endure drouth and hot weather rather better; withstand the attacks of foliage-eating insects very well; those of the Norton group are less injured by fungi; and, most important of all, because of hard roots, are less injured by phylloxera than most other cultivated American grapes. All are tender to cold, and, as has been said, the pure-breds are difficult to propagate either from cuttings or by grafting. Nearly all, except Delaware, require long hot summers to produce good crops.

VITIS VULPINA, THE RIVER-BANK GRAPE

The River-bank grape, *Vitis vulpina* (better known by grape-growers as *V. riparia*), is the most widely distributed of the several species of American grapes that have been brought under cultivation. Wild and domesticated forms are found from New Brunswick, Quebec, Lake Superior, and the Dakotas, south to the Carolinas, Arkansas, and Texas. Wines have been made from the wild fruits of this species from the earliest settlements in the Atlantic states, and the grapes have been gathered from wild vines for domestic purposes in nearly all parts of eastern America, from Jamestown down to the present. Few attempts were made to domesticate this species until the middle of the last century, when the good qualities of its vines and grapes attracted the attention of French grape-growers. They found that the vines were resistant to phylloxera and that good wine could be made from some of the varieties on which they were grafting *Vinifera* grapes; now many varieties are under cultivation in America.

The vines of *Vulpina* grapes are distinguished by slender vigorous trunks; leaves thin with large leaf-blades, entire, the three or four lower ones five-lobed; light green, glabrous above, glabrous or sometimes pubescent on ribs and veins below. (See Plate iv.) The clusters are small; berries black, or sometimes green, with heavy bloom; seeds two to four, small; very variable in flavor and

time of ripening. The flavor is usually sharply acid, though the sugar content is higher than that of the Labruscas and about as high as in the Aestivalis grapes. The flesh is neither pulpy nor solid; and neither seeds nor skins are as objectionable as in Labrusca varieties. The wine is tart and rough at first but mellows with age.

Vulpina grapes are most promising for developing varieties for American vineyards, because of vigor of vine and capacity to endure cold, heat, drouth, and moist soils. They are resistant to phylloxera, the roots being small, hard, and numerous. All are easy to propagate from cuttings. They make a good stock upon which to graft less vigorous American grapes and those susceptible to phylloxera. The high esteem in which they are held by the French for grafting is indicated by many varietal names, such as Riparia Gloire, Riparia Glabre, Riparia Scribner, and Riparia Martin. The foliage is rarely attacked by the mildews; black rot is not very fond of the leaves; but the varieties are favorites for the leaf-hopper. They grow in vineyards only on well-drained, rich soils, not too heavy, and of all species do least well on soils having much lime. Vulpina hybrids are widely used in France, and ought to be in America, for stocks, on which most other grapes are easily grafted, thereby being made not only resistant to phylloxera, but more vigorous and productive.

The best known varieties of *Vitis vulpina* are Clevener, Clinton, Elvira, Empire State, Grein Golden, Janesville, and Taylor, though some of these are probably hybrids with other species. Clinton and Clevener have been much used in eastern America for red wines, though the wines from both are tart and rough unless well aged, or, better still, blended. Elvira and Grein Golden are exceptions, as both of them make mild white wines often used to blend with Catawba and Delaware in dry white wines and Champagnes. Janesville can be grown as far north as any other grape, but is too tart for pleasant eating, though very good for culinary purposes. The wines of Jancsville are hardly drinkable unless blended.

VITIS ROTUNDIFOLIA, THE SCUPPERNONG GRAPE

The far South has a table and wine grape known in the South Atlantic and Gulf states as Scuppernong, Muscadine, Bullet, Fox, Bullace, and Bull grape, the several names suggesting long familiarity and wide distribution. When John Hawkins relieved the starving French at Fort Caroline in Florida in 1565, he found they had '20 hogshead of wine made from the native grapes.' The grape from which this wine was made could only have been the Scuppernong. A vine of this species grew on Roanoke Island, North Carolina, which tradition says was planted by Amados and Barlowe in 1584. The trunk and vine were of great size, by reason of which, and because of its great age, it was long called the 'Mother Scuppernong.'

Vitis rotundifolia grapes grow wild from southern Delaware to Florida, westward to southern Missouri and Arkansas and south to the Gulf of Mexico. The vines are rare in the western locations but very common near the ocean and the Gulf, thriving best on sandy well-drained bottom lands. The climate of the Cotton Belt suits it perfectly. The vines are usually killed by temperatures lower than zero; they like the heat of the southern sun, but will not grow well under semi-arid conditions—rain they must have.

As has been indicated, *Rotundifolia* vines attain great size; often new plants start from aerial roots; the wood is hard and warty; the leaves are small, roundish, dense in texture, light green, and usually smooth on both surfaces. (See Plate v.) The fruit-clusters are small, having only two to twelve berries. The berries are large, round, black, or greenish yellow; with thick tough skins, which adhere strongly to the pulp; the pulp is tough, and, with the skin, has a musky odor. A very marked character of the berries is that they ripen unevenly and, as soon as ripe, drop. In the South these grapes are harvested as single fruits; all other grapes are called 'bunch grapes.'

Varieties of this species are resistant to a remarkable degree to insects and fungi. The vines of *Rotundifolia* grapes are as re-

sistant to phylloxera as those of any other species, if not more so. Unfortunately, its plants cannot be used as stocks for other grapes, since it is most difficult to make the grafts live. It is also almost impossible to grow *Rotundifolia* plants from cuttings. The easiest method of propagation is by layers, a slow and tedious process. Neither will the varieties of this species hybridize readily with those of any other. The truth is, *Rotundifolia* is pretty far removed in both vine and fruit characters from any other grape. Probably no other fruit, certainly no other grape, is grown with so little care. It alone, of all species, can be grown fairly well without pruning.

Wine-makers are divided in opinion about the value of *Rotundifolia* for wine. The grapes are lacking in sugar and acid, and both must and wine have a disagreeable musky aroma. The berries are very juicy, some varieties yielding as much as four gallons per bushel. About the only wines good enough to drink are sweet, and these quickly cloy the appetite. Grapes of most of the varieties are not suitable to eat out of hand because the juice exudes from the point of attachment to the stem, smearing the berries. Commonly the fruits are harvested by shaking the vines at intervals, so that the berries will drop on a cloth beneath.

Perhaps a score of *Rotundifolia* varieties are grown in the great spread of the Cotton Belt. The best known is the yellow freckled Scuppernong, so variable that it constitutes a group rather than a distinct variety. This is by far the oldest named American grape. Eden, Thomas, James, Memory, and Mish are all well-marked varieties. T. V. Munson, of Denison, Texas, made several hybrids of *Rotundifolia* with other species, but none is in general cultivation.

VITIS RUPESTRIS, THE SAND GRAPE

Vitis rupestris is called, in the several regions in which it is wild, Sand, Sugar, Rock, Bush, and Mountain grape. The species is most at home in southwestern and central Texas, but is found sparingly eastward and northward to Oklahoma, Arkansas, Kentucky, and Tennessee. Its favorite sites in the wild are sandy banks, rocky beds of dry water courses, low hills, and mountain

sides, often in exposures too hot and dry for any other grape. Under cultivation, it may be grown in a much larger area.

This grape is widely different from the other American species under cultivation. It is a small much-branched shrub two to eight feet high, though under favorable conditions it attempts to climb. The leaves are small, broadly cordate, coarsely toothed, and wholly smooth on both surfaces. (See Plate vi.) The bunches are small, slender, and very loose. The berries, also, are small, though as large as those of wild *Vulpinas*; they are black or purple-black, without bloom. Under cultivation the foliage and fruits are resistant to rot and mildew, and the long, slender, hard roots, which go down deeply, are perfectly resistant to phylloxera. The vines are easily propagated from cuttings, and the stocks take and bear grafts well.

Very little has been done with this grape in vineyards to produce fruit, but the French have used it rather commonly as a stock to secure immunity to the formidable phylloxera. French viticulturists have developed several strains for stocks, some of which have been used in America and might be much more commonly grown, both to encourage greater productiveness in weak-growing varieties of other species and for grape-growing in rocky, gravelly, dry soils and hot exposures. The best French stocks for America are *Rupestris du Lot* and *Rupestris St. George*.

Not much can be expected from pure-bred or hybrid varieties of *Rupestris* for table grapes or wine. The clusters and berries are so small that the vines are unproductive. In other respects the fruits have considerable merit. The sugar and acid content is high and well balanced; the flavor is sprightly, pleasant, and wholly free from disagreeable aroma; the skins and seeds are not too objectionable, and the skins carry an abundance of dark red pigment. In France, a very good red wine of the claret type is made from stocks of this species allowed to become direct producers.

MINOR SPECIES OF THE GRAPE

Besides these nine major groups, counting the two sub-species, three more have some promise for vineyard varieties. These are:

Vitis Doaniana, a black grape, wild from Oklahoma to New Mexico; *V. Munsoniana*, the Bird grape of south Florida, closely related to *V. rotundifolia*, and, probably, the only species that can be cultivated in the region where it grows wild. The third species is *V. Girdiana*, found in valleys in southern California southward to Mexico. Were it not for the fact that wild hybrids are frequently found between *V. vinifera* and *V. Girdiana*, where there are vineyards of the former, and where the latter is indigenous, this wild grape would hardly be worth mentioning. It is almost certain that the Mission grape, the mainstay of viticulture in California and Mexico for two centuries before European varieties were freely introduced, is one of these hybrids.

2. *The Grape Plant*

No other fruit plant needs quite so much care as a grapevine. It must be trained so that every cluster has the greatest possible amount of air and sunshine; most of its needless wood must be cut away every winter; the riotous life of leaves and shoots must be pinched back in summer to drive the rich juices into the few clusters an affluent vine is permitted to retain. Fleshy roots and those that spread far must be planted so and so; hard, slender, deep-going roots, quite differently. There must be no mystery about the grape plant to one who wants to grow vines properly.

If one knows well the parts of a vine, their functions, and how they differ in the several species, the task of growing grapes is much more pleasant and far less difficult. The work of pruning and training become simple, and, instead of seeming ruthless and cruel, is recognized as an office of friendship, guiding the vine to a more luxuriant life and greater fruitfulness.

Let me emphasize: *One must know the natural history of the plant to grow grapes well.* The practical man must not skip this chapter.

DESCENDING AND ASCENDING PARTS OF A GRAPE PLANT

The descending axis of a grape plant, the part under the ground, is, as in every other cultivated plant, the *root*. There are few parts to a vine's root system as compared with those of the trunk; but, as we shall see, the few do differ in structure in different species.

The trunk, or ascending axis of a grape plant, the part above ground, is divided both botanically and horticulturally in perhaps a dozen distinct structures—as canes, shoots, tendrils, buds, leaves,

flowers, fruit clusters, berries, and seeds—every part being of prime importance in the cultivation of the grape.

ROOTS OF THE GRAPE

The roots of the grape function as an organ of absorption; as a food reservoir; and as a means of mechanical support. One readily distinguishes the *root-crown*, where root and trunk unite; the *tap-root*, the main axis plunging downward; *rootlets*, the ultimate divisions of the root; and the *root-tip*, the collective mass of cells, which, in the growing season actively divide and extend the root system. This root-tip has a tough *cap*, a protection as the rootlet assertively pushes its way far and wide—and sometimes deep—in the soil. Behind the root-tip are many fine *root-hairs*, which, by osmosis, absorb the soil solutions. Root division constantly takes place until, in the course of a few years, the root system is formed. In a cultivated vineyard, one may expect the roots to spread much farther than the pruned tops.

At first thought, one might think that roots form only from seeds; but a fact of prime importance to grape-growers is that they grow from cuttings and layers of canes, whereby all vineyard plants are propagated. There are no differences between the roots that grow from seeds and those from canes, except, perhaps, that those from canes are more branched. A seed usually sends down a single tap root.

Roots of different species of grapes vary greatly both in structure and in behavior. In the European grape, *Vitis vinifera*, they are so fleshy and soft that they are easily injured by insects, especially the dreaded phylloxera. In some plants, as those of *V. vulpina* and *V. rupestris*, the roots are slender, hard, and very resistant to phylloxera, hence these species are much used as stocks upon which to graft the soft-rooted European grapes. The roots of most grapes spread laterally to wide distances, but those of *V. rupestris* penetrate straight down into the ground from the crown.

THE TRUNK OF THE GRAPE

The *trunk* is the main stem of the grape plant; it bears all the lesser parts of the top, and holds aloft the canopy of leaves. Through the trunk pass all the nourishing substances absorbed by the roots up to the leaves, where food is manufactured for the whole plant. The sap passes up and down the trunk in such great quantities in the spring that when the vine is cut in pruning it 'bleeds' freely and inexperienced grape-growers fear for the life of the plant—a wholly needless worry.

The soft formative tissue between the woody cylinder and the bark of the trunk and its branches is the *cambium layer*, from which new wood and bark originate. The cambium layer is the particular part which must be joined in any kind of grafting. It extends into the roots as well as in the trunk and its branches.

The grape-grower is little interested in the bark of his vines, but the botanist finds this outer covering a valuable means of distinguishing species. In some species it peels off in flakes; in others in shreds. The color of the bark is another distinguishing character. Fortunately, this tough outer vestment of trunk, canes, and roots is seldom injured in vineyard operations. The lens-shaped corky cells, large or small as the case may be in different species, are the *lenticels*, through which air penetrates to the interior.

In the leaves and green shoots of the grape, as in all other plants, are minute orifices, usually most abundant on the lower side of the leaves, each of which is a *stoma*. It is through these little mouths that air and gases enter the green parts of the plant. A stoma in a shoot becomes a lenticel in a cane.

In most grapes the trunk, left to itself, is tall and slender, climbing to the tops of high trees. In *Vitis rupestris*, the Sand grape, the trunk may be only a few feet high; and in the stump-training of the Old World grape it may be kept down to a few inches. In Italy, the trunks of this same Old World grape may be trained to the tops of trees. Vines of almost any species of the grape may attain enormous size. The famous vine in the greenhouse at

Hampton Court, England, has a trunk several feet in circumference supporting several hundred square yards of leafy branches. Some seasons there are as many as 1,500 bunches of grapes, which weigh 2,000 pounds—a ton of grapes on a single vine. The Mother Scuppernong Vine on Roanoke Island covers nearly an acre of ground and must bear as great a weight of fruit, though many times as many bunches, as the vine at Hampton Court.

ARMS, CANES, AND SHOOTS

The main branches of the trunk, more than one year old, are called *arms*. These are of great importance in pruning the vines since fruit-bearing shoots are often made to grow from them. *Canes* are dormant one-year-old branches, the ripened shoots of the preceding season. The powdery coating on the canes of some species is the *bloom*. The term *old wood* designates all parts of a vine older than one year. The *head* is the region of the trunk from which arms grow to right or left. A *spur* is a short piece of an arm projecting from the trunk, from which new canes are trained to keep a vine within proper bounds.

A *shoot*, as the name implies, bursts from a bud in late spring and grows rapidly. A *lateral* is a secondary shoot growing from a main shoot. The stem of a shoot may be round or angular; smooth, or covered with tomentum, hairs, or even spines. The shoot, with its characters, may furnish distinguishing marks for both species and varieties. More important to the grape-grower, the shoot is the part of the vine which bears grapes, so that the number of shoots helps to indicate the size of the crop. In some species, shoots bear one bunch of grapes; in others, two. A *node* is the point on a cane at which buds appear, followed by leaves, or tendrils, or shoots, or

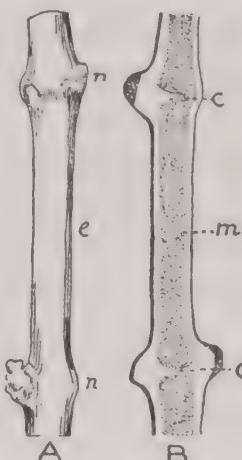


Fig. 1. A, Section of a grape cane in winter; B, Longitudinal section; n, node; e, internode; c, diaphragm; m, pith.

flowers, or fruits, as the case may be. The space between nodes is an *internode*; it may be long or short.

The cane of a grapevine contains a spongy *pith* at its center. This pith is interrupted in some species by a woody partition at the node called the *diaphragm*. It is present in all species of cultivated grapes except *Rotundifolia* and *Munsoniana*. It is very thick in the vines of *Labrusca* and *Aestivalis* grapes; thin in all pure-bred *Vulpinas*. The presence or absence and the thickness of the diaphragm are good distinguishing characters of species and varieties. Figure 1 shows sections of a cane and their parts.

BUDS

The *bud* of a grape is somewhat unique. Shoots, leaves, tendrils, flowers, and fruit all make their appearance in a short growing season from buds growing from canes. Few other plants show an energy-saving device so simple. Buds are of two kinds: those plainly visible and invisible ones imbedded in old wood, called *adventitious* buds. An *eye* is a compound bud borne at a node. The strongest bud in an eye is a *primary bud*; weak buds in the eye are *secondary buds*. *Water sprouts* are weak-growing shoots which usually grow from adventitious buds; they seldom serve a useful purpose and are thus, in a way, parasites on a vine, though occasionally one may be used to renew a cane.

Examined in the winter, what appears to be a single bud, covered by dark hard scales and soft tomentum, is found to be a central well-developed bud and two secondary ones. It is the central bud from which shoots arise to bear leaves, tendrils, flowers, and fruits; but, as if to make certain that grapes will be borne from every eye, if the main bud is killed by cold or otherwise, one of the secondary buds will take its place. Buds vary greatly in different species in size, shape, and color. They also vary in time of opening and in the angle at which they stand forth from the cane.

All in all, the bud of a grape is a marvelous organ. One sees it first in autumn and winter, seemingly as lifeless as a pebble. Packed within is the miracle of life. In the sun and warmth and soft rain of spring, this inert bud swells and strengthens with a

force that cannot be contained. The sheath bursts and delicate leaflets of green, yellow, or pink appear and develop into leaves; shoots, flowers, and fruits follow; the fruits bear within precious seeds, the ultimate goal of every bud.

LEAVES

The grape is slow in coming in leaf. Long after the tree, bush, and bramble fruits are covered with green, the leaves of grapes make their appearance. The grape-grower quickly learns to distinguish his varieties by the color and texture of their young leaves; some are green, others yellow, and still others are shades and hues of red; the edges of some may be creamy, surprisingly soft and delicate in texture; some are smooth and glossy, while others are pubescent.

The expanded part of a leaf is the *blade*, or, to be a little more scientific, the *lamina*. The stem of a leaf is, in botanical parlance, the *petiole*.

All species and many varieties may be distinguished by the thickness, shape, lobes, teeth, and texture of their leaves. The leaves of Vinifera grapes are so thin that they are scorched by the hot suns of our southern states. Those of Vulpina and Rupestris also lack density; while those of the several other American species are thick. The upper surface of the leaves of some grapes are smooth, glossy, and shining; of others rough; the lower surfaces may be smooth, or downy, or pubescent. The colors of both surfaces vary from light to dark green; or may be bluish or nearly white on the lower side and often are covered with bloom.

The shape of the leaf is one of the most reliable means of distinguishing varieties. In outline, a leaf may be broader than long, ovate, or orbicular. The leaves of some grapes are entire but in most species they are distinctly lobed. Deep divisions may divide them into three, five, or seven lobes. Nearly always they are toothed, often characteristically so. The deep indentations between lobes are very regular in size and shape and are called *sinuses*; usually they are U-shaped but they may be V-shaped. The sinus in which the stem or petiole joins the leaf-blade is the *petiolar*

sinus, a character much used in separating species. Many species of grapes bear two forms of leaves, or are *dimorphic*, those of seedlings being much narrower and more deeply cut than those of mature leaves.

Some grapes bear thin, brownish scales at the base of the petioles. They are the *stipules* of the botanist. In some species they are about a fourth of an inch long; in others so small that they can scarcely be seen.

The arrangement of veins is very different in the several species and has been much studied by botanists. In the sinus, where the leaf-blade is joined to the petiole, several large veins spread fan-wise to the distant edges of the leaf, each such vein sub-dividing into smaller ones so that they become a complex system, each species having a pattern of its own and no two leaves being the same. One sees at once what the function of these veins is: they carry the sap brought from the roots through the trunk and canes to be changed by sun and air into food to build up the plant. The characters of leaves are well shown in the several preceding plates in this text.

TENDRILS

A surprisingly important organ to viticulturists is the slender, leafless sprig at the tip of the shoot, or opposite, or alternating with the leaves. This spirally-coiling branchlet is called a *tendril*. Its chief function is to serve as a means of attachment to whatever supports the grapevine; thus, it is especially important when one prunes and trains the vine. The number and manner in which tendrils are borne help materially in separating species. Thus, in some species, tendrils are very strong and persistent; in others, weak and transient. In some species the tendrils are opposite leaves; in others intermittent with them.

Vitis Labrusca, the common Fox grape, parent species of many vineyard varieties, has a tendril or a flower-cluster opposite nearly every leaf; this arrangement constitutes *continuous tendrils*. Nearly all other species have two leaves with a tendril opposite each and a third leaf without a tendril; such species are said to have *intermittent tendrils*. The lowest leaves of canes usually have no op-

posite tendrils. Tendrils may be long or short; stout or slender; simple, bifurcated or trifurcated; smooth, pubescent, or warty.

If tendrils are studied in blooming time, it is plain to be seen that they are modified flowering branches. At this time, flower clusters open fully as flowers; or, a part of the flowers do not mature into blossoms, but the flower-stalks become tendrils. Tendrils may be studied in the several plates.

THE GRAPE FLOWER

Some time in June, the yellow-green flower clusters of grapes appear in the northern states of America. Many leaves on the



Fig. 2. Grape flower clusters: (Left) Upright stamens of Delaware; (Right) Depressed stamens of Brighton.

young shoots have expanded before blooming time, and the inconspicuous flower clusters are almost hidden by the abundant foliage. When many flowers are out, one is guided to them by their delicious fragrance, rather distinct odors characterizing different species. Odors have an important function; they attract insects that aid in pollination and hence help to ensure better berries and fuller bunches. The stalk of a flower-cluster is the *peduncle*; of a single flower, the *pedicel*. The *flower-cluster*, or *inflorescence*,

consists of many small individual flowers, which become a bunch of grapes and its stem.

Examined in detail, each flower bears a shallow rim having five minute teeth, the calyx, which bears the petals and stamens. The five narrow, greenish-yellow petals cohere at the top, forming the

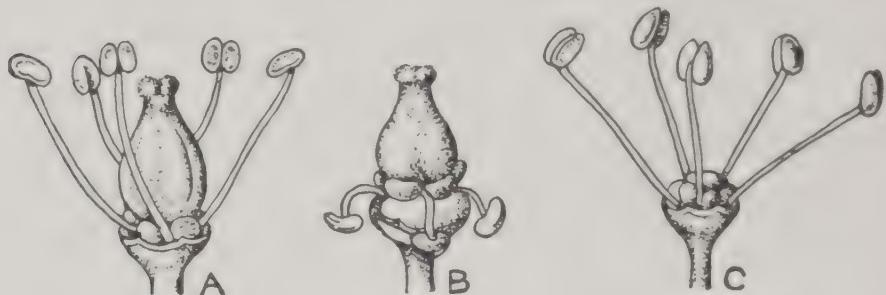


Fig. 3. Grape flowers: A, Hermaphrodite flower; B, Female flower; C, Male flower.

cap of the grape flower. This cap is pushed off as the flowers develop, disclosing five upright stamens with pollen-filled anthers, and a central pistil, which in time will mature into a grape. Looking more closely, one sees between the bases of the stamens and

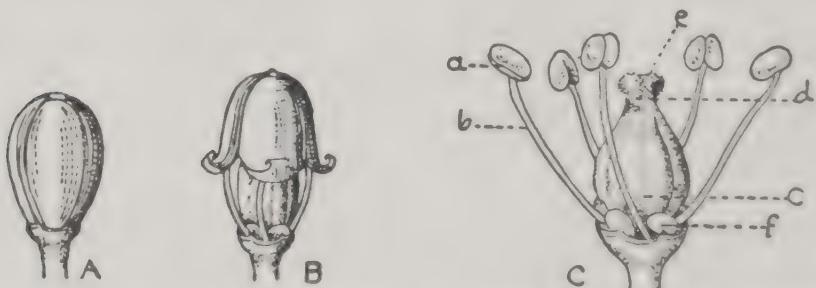


Fig. 4. The parts of a grape flower: A, Closed flower bud; B, Opening flower; C, Full bloom; a, anther; b, filament; c, ovary; d, style; e, stigma; f, nectaries.

the central cone-shaped pistil, five bright-yellow glands, the *nectaries*; these glisten in the sunshine with the nectar they distill. The flower is characteristic of the genus *Vitis*.

Botanists distinguish three types of grape flowers in respect to sexual characters. Most flowers of cultivated grapes are *perfect*, or

hermaphrodites, in which five strong, erect stamens and a single well-formed pistil are present. A second group of flowers are *imperfect hermaphrodites*, in which the reflexed stamens bear sterile pollen. In a third group the pistil is rudimentary and the stamens bear viable pollen; these flowers are said to be *stamineate*. As students of botany know, stamens consist of *filaments* and *anthers*, the latter being sacs of *pollen*, the male element in plant life; while



Fig. 5. Stamineate and perfect clusters on one vine: (Right) Stamineate; (Left) Perfect.

the female organ consists of an *ovary*, *style*, and *stigma*. Figures 3 and 4 show the parts of a grape flower.

The ovary of the little cone-shaped pistil is two-celled, with a pair of ovules in each which become bony seeds. After fertilization this ovary matures into a berry, the grape, the fruit for which the grape-grower plants and tends his vineyard.

Fertilization takes place when viable grains of pollen from the bursting anthers are carried by wind, or insects, or dropped by gravity on a well-formed pistil, and its contents fuses with an ovule far down in the ovary. It follows that stamineate flowers cannot produce fruit, since they lack female organs, but pollen from them may fertilize female or pistillate flowers.

Some species of grapes bear fertile flowers on one vine and sterile ones on another; these species are said to be *polygamous-dioecious*. Vines with fertile flowers only are seldom found in the

wild, but usually only plants with fertile flowers are selected for cultivation. Plant-breeders find, to their annoyance, that many plants raised from seeds are sterile.

It is fortunate for the grape-grower that most cultivated grapes have perfect flowers, but an occasional variety, sometimes a very desirable one, bears imperfect flowers and must be cross-fertilized to produce grapes. A few varieties are partly self-fertile; these produce better crops when varieties bearing viable pollen are planted near them. Contrary to common belief cross-fertilization in no way changes the grapes that follow. The seed alone is changed. This fact is revealed, and the changes are made evident, only when the seed has produced a new plant. This new plant is the *hybrid* of the plant-breeder, a matter so important that it receives further discussion in the chapter on plant-breeding.

The time of flowering is of value to the botanist in distinguishing species and, of course, is of much interest and value to the grape-grower. The first species of viticultural value to flower is *Vitis vulpina*; *V. rupestris* blooms shortly after; next comes *V. Labrusca*; followed by *V. vinifera*; last to flower is *V. aestivalis*, though *V. aestivalis* var. *Lincecumii* blooms a little before *V. Labrusca*. Pure-bred cultivated varieties of all wild grapes retain the blooming time of the species from which they are derived, though since so many are hybrids the blooming time of most varieties must be noted for each.

THE FRUIT

First, let us note the shapes and sizes of bunches and berries of grapes. The bunches of nearly all grapes are conical, broadly tapering from stem to tip; a good many are cylindrical; some have one, others two shoulders, and a few are divided into several large and small parts. Bunches may be large, as are the bunches of Black Hamburg, which sometimes weigh several pounds, or small, as are those of the Delaware or Clinton. The berries of most varieties of the European grape are oval, while those of nearly all American species are round or oblate. Curiously enough, the berries of nearly

all the hybrids between the European and our native species are oval.

The grape berry consists of *skin*, *flesh*, and *seeds*. Those who use grapes to eat out of hand, in the culinary arts, for wine, grape juice, and raisins are mainly interested in the *flesh*, the soft pulpy part of the grape. The flesh of all European grapes is tender and separates readily from the seeds but not from the skin; while the flesh of pure-bred American grapes is a rather tough, pulpy mass, sometimes stringy, which does not separate easily from the seeds but quite so from the skin. Varieties of European grapes are usually eaten flesh, seeds, and skin; while most Americans in eating the fruits of our native grapes swallow the flesh and seeds, but eject the skins.

The flesh of most grapes is translucent and colorless, with colorless juice. In a considerable number, however, the pulp is light or dark red. White wines may be made from all varieties which have colorless juice, some of which are used in making red wines if there is red pigment in the skin. Those having red juice are used only in making red wines.

A matter of prime importance to those making wine is the percentage of sugar and acid in the juice. There is seldom enough sugar but often too much acid to make fine wines from American grapes. The wine-maker likes to have 21 or 22 per cent of sugar and 7 to 9 grams of acid per liter. These important matters must be discussed at considerable length in the chapters on making wine. To eat out of hand, or for culinary purposes, the amounts of sugar and of acid are of small moment, though good raisin grapes must have much sugar. Taste tells little about the amount of sugar in grapes. The rather sweet Labruscas, such as Concord and Niagara, do not have as much sugar as the sour-tasting Clinton. All good grapes are turgid with juice; all can be eaten noiselessly, wholly lacking in solids to chew.

The skins of varieties of the European grape are so strongly adherent to the flesh that they are eaten together, while those of most American varieties have *slip-skins*. The skins of some grapes are thick and do not burst easily, hanging to their pedicels until

full maturity; others have skins so thin that they burst before fully ripe, and do not keep well or ship well even if the skins are whole at harvest time.

The most apparent character of grape skins is their color, which varies from greenish-yellow to amber; and from pink to light red, dark red to violet, or bluish-black. The color of grapes, for the most part, is caused by pigments in the skin. These pigments are insoluble in water but are readily soluble in alcohol. For white wines, as we shall see, the juice of grapes is separated from skins and seeds before fermentation; but for red wines the separation does not take place until fermentation is over, and much of the color is extracted from skins and pulp by the alcohol derived from fermentation.

Flavor, of course, is the chief gustatory quality of the grape. It goes without saying that a grape, to be good, must taste like a grape and of the particular species to which it belongs. Then you may say 'it is sweet' or 'it is sour.' All grapes of high distinction are sour, or at least tart. Having separated grapes into sweet and sour, one comes to a vast range of flavors, a distinct flavor for every one of the several thousand varieties. Words to characterize all flavors are not to be found. One may say spicy, vinous, perfumed, and so on, but such words convey little to a person to whom an attempt is being made to describe a particular variety.

Almost every variety of grape has a characteristic odor, most strongly apparent when the fruit is stored in mass. Concord, Niagara, and their near relatives have a rank, foxy odor that debars them from making fine wines. The strong, musky odor of the southern Muscadines is also unpleasant, while that of the European Muscats is agreeable and likeable in table grapes but not in wines. These odors for the most part reside in the skin or in the flesh next to the skin.

There is in all good wine grapes a delicate evanescent thing called *aroma* from which comes the *bouquet* of wines. Aroma and bouquet often lie coyly hidden in fruit or newly made wine to come forth when properly wheedled to bespeak 'at its best' the products they inhabit. Aroma and bouquet betoken centuries of

breeding in the vine, and sun, soil, and care in any particular vineyard. There is a vast nomenclature to describe the aromas of grapes and the bouquets of wines, which, with many everyday adjectives and adverbs, are wholly inadequate.

At maturity, especially when newly picked, all grapes have in greater or lesser quantity a delicate powdery, waxy coating called *bloom*. This bloom, so attractive to a sensitive eye, can be preserved only by careful handling. At best, it disappears almost completely in storage. Its office, in nature's economy, is to prevent evaporation of the juice of the grape; without question it catches and holds the grape yeasts so necessary in fermentation. But it also entraps the germs of rots and mildews, which find entrance in the slightest break of the grape's skin.

Finally, the skins of grapes contain tannic acid, a strongly astringent substance which wine-makers usually speak of as *tannin*. This astringent acid is desirable in moderate quantities in red wines, extracted by fermentation, but very little is wanted in white wines.

Several other terms are used in describing grapes which all should know. The *peduncle* and *pedicel* are the same as for the flowers; the *brush* is the end of the pedicel projecting into the fruit. The point of attachment of bunch or berry is the *base*, while the opposite end is the *apex*; the coloring matter in the skin is the *pigment*; the rancid taste and smell in some grapes is *foxiness*; lastly, *quality*, a term often used, is the combination of characters that makes grapes pleasant to taste, sight, smell, and touch.

GRAPE SEEDS

The shape, markings, and color of grape seeds are much used by botanists in distinguishing species, but these characters are of little interest to viticulturists. The size, weight, and number of seeds in a variety are of importance in both table- and wine-grapes. Of the American species under general cultivation, the Labruscas have the largest seeds, Aestivalis varieties next, and the Vulpinas the smallest. The seeds of the two last species are, perhaps, as noticeable as in the Labruscas, because of the small size of the ber-

ries. *Vinifera* grapes have fewer and smaller seeds than the American species, and as these are not hard they are readily eaten. Grape berries that have not been pollinated are seedless. There are many seedless varieties in *Vitis vinifera* and in hybrids of this species with American grapes.

Four technical terms are used by botanists in describing grape seeds. These are: *beak*, the narrow prolonged base of the seed; *hilum*, the scar left where the seed was attached to the *seed-stalk*; *chalaza*, the place where the seed-coat and kernel are attached; and the *raphe*, the ridge that runs from the hilum to the chalaza.

HARDINESS IN GRAPES

Grape-growers in northern climates must always keep hardiness in mind. The European *Vinifera* and the American *Rotundifolias* are a little less hardy than the peach. American varieties, other than those from *Rotundifolia*, are nearly all as hardy as the apple. *Vitus vulpina* is the hardest cultivated species; *V. Labrusca* comes second; while of the commonly cultivated species, *V. aestivalis* is the least hardy. The range of varieties in hardiness falls within that of the species to which they belong. Cultivated varieties harder than the wild species of which they are a part are not known. Grapes are described in formal descriptions as *hardy*, *half hardy*, and *tender*.

3. Propagation

FEW who grow grapes, whatever the size of the vineyards, propagate the vines they plant. Grapevines are cheap, easily obtained in any part of the country, and are usually better when grown by a nurseryman, skilled in propagation, and on soils and in climates well suited to the work. Still, there are those who like to grow their own vines.

There are several reasons why the owner of a home vineyard should know how grapes are propagated. He has a better knowledge of the proper care of his vines if he knows whether they come from seeds, cuttings, or layers; whether they are on their own roots or those of another plant; and how he can change a variety by grafting if he so desires. Sooner or later, most amateur grape-growers try their hands at growing new varieties, in which sowing seeds is necessary. One propagates grapes from seeds, cuttings, layers, and by grafting.

GROWING GRAPES FROM SEEDS

It is as easy to grow grapes from seeds as it is any other fruit. First, the seeds, after having been taken from ripe grapes, must have a resting period of a few months. The approved method of giving this rest is to stratify the fresh seeds in moist sand and store in a cool place over winter. Or, the seed may be sown in the autumn. Whether planted in autumn or spring, they are sown an inch or two apart, an inch deep, in rows a foot apart. Better still, they are sown in flats, the seedlings to be set out when true leaves appear. In ground that crusts, the tender seedlings will come through more quickly if a mulch of moss, lawn clippings, or saw-

dust covers the rows thinly. Figure 6 shows the development of a grape seedling.

In due course the young plants are thinned, or transferred to nursery rows to stand six inches apart. Thinning is disheartening work for with every plant pulled, its virtues undiscovered, one is sure that a valuable grape is being lost to viticulture. One has a



Fig. 6. The development of a seedling grape.



Fig. 7. A cutting beginning growth.

more comfortable feeling if the surplus plants are tenderly lifted and transferred to another row.

A seedling grape flourishes like a green bay-tree and often makes three feet of wood the first season. In the autumn this over-luxuriant growth is cut back to six or eight inches; the earth is then pulled up to the plants for winter protection. It is leveled the next spring, and cultivated through the summer; and, if all is propitious, the seedlings are cut back again, and are ready for the vineyard at the end of the second season. In the autumn of the third year, the vines are cut to stocky trunks of two feet. One then holds his breath until the grape harvest of the fourth summer when he may be rewarded by a few bunches of grapes on each

vine, every vine a new variety of his own creation. For, as the reader need hardly be reminded, the seeds of no grape come true to variety. Seeds from the dark-skinned Concord may produce red- or green-skinned grapes; those from the green Niagara, red or black grapes. From either, a male plant may grow, which will never bear grapes. The grape-breeder must be prepared to discard at least 999 out of every 1,000 seedlings as not worth further trial. Producing new varieties is a game of little gain but of much pleasure.

PROPAGATION BY CUTTINGS

There is no gamble in reproducing vines from cuttings. One detaches a part from a mother vine and lets it grow. All vines for vineyards, with the exception of varieties of *Rotundifolia*, are grown from cuttings of hard wood taken from canes when the vineyard is pruned. By this miracle of nature an infinite number of plants, running down through the years, come from a single seed, each plant exactly like the original vine and like all its fellows.

Cuttings are made from one-year-old wood. Immature canes and those with soft, spongy wood make poor cuttings; and those taken from very large canes do not root as well as those from medium-sized wood. Short-jointed wood is better than long-jointed. The cuttings should be smooth and straight for convenience in handling.

The sooner the cuttings are made after the canes become dormant the better. It takes time for the cut ends to form a protective callus from which spring, on the lower ends, the adventitious roots. The grape is most accommodating in this matter, however, and good cuttings may be made up until a few weeks before buds begin to burst.

Six to nine inches is the usual length of cuttings in eastern America; the hotter and drier the soil the longer they should be. In very dry light soils the cuttings might better be a foot in length. Those made at one time should be of the same length, to secure which some simple gauge or a cutting-box should be used.

A slanting cut is made close to the heel of the cutting; an inch

of wood is left above the top-most bud. The finished cuttings are tied in bundles, all butts one way. The bundles are heeled-in, butts up, and covered with a few inches of soil. Butts up is the rule, otherwise the tops start to grow first, and it is important that the upper buds remain dormant until the roots are well started.

Cuttings are planted in nursery rows far enough apart for cultivation, and are set three inches apart in the row. The trenches in which they are set are made with a spade or plow deep enough so that the upper buds show above the ground—perpendicular if the cuttings are shorter than six inches and slanting if they are longer. Two inches of soil are pressed firmly about the base of the cutting; the trench is filled, after which it remains only to keep the soil moist and mellow through the summer. Figure 7 shows a cutting beginning growth.

Delay in planting invites injury from the dry weather which may be expected every summer in America. The cuttings should be put in the ground, therefore, as early as the ground can be worked in the spring; and, if all is propitious, especially in the matter of rainfall, a growth of at least four feet is made the first season.

An amazing number of vines can be grown on a small bit of land. With the cuttings three inches and the rows three feet apart, 58,080 vines may be grown to the acre. A square rod of good garden soil, in which the rows can be set two feet apart, will supply a small vineyard with all the plants needed.

Sometimes, as in multiplying a new variety, a single eye may be used for a cutting. In this case, a slanting cut is made an inch above and below the eye. These short cuttings need to be set in a hot-bed or cold-frame, where they can be given heat and moisture. Single-eye cuttings do not make strong plants, unless they are transferred from the hot-bed to a good garden soil where they can be cultivated and watered in a dry summer. Eventually, with good care, the plants are as strong as those grown from longer cuttings.

PROPAGATION BY LAYERS

Some grapes, as all varieties of *Rotundifolias*, do not grow from cuttings. These varieties, as well as all others, are readily grown

by *dormant-wood layering*. The method is so simple and certain that it is recommended to small growers. It is less desirable than reproducing from cuttings, only because far fewer plants on any piece of land can be grown by this method.

A *layer* is a branch of a plant bent to the earth, covered with soil, to take root, while still a part of the parent. Layering is done in the spring, but the vines from which the layers are taken receive preliminary treatment the season before.

The vines from which layers are to be made must be cut back heavily in the spring a year before the layering is done to induce a strong growth. Vigorous canes are laid in a shallow trench, two to five inches deep. The trench is partly filled with moist, mellow soil, firmly packed about the cane. One may expect, almost without fail, that plants will soon show above the ground; when these are three inches high, the trench is filled; a little later the plants are staked to keep them out of the way of the cultivator. If the season is a good one, these layered vines, nursed by the parent vine, make a luxuriant growth ready for the vineyard in the autumn.

Grapes may also be layered in the fall, in which case even more vigorous plants may be grown. In fall-layering, the canes are notched or ringed at the joints and laid in trenches as they are in the spring. The less the number of joints covered, the stronger the young vines, so that while the number is usually four or five, the plants are extra vigorous if only two or three are grown. The larger number on the assertive Concord or Niagara may well be permitted, but on the weak-growing Iona, Diana, or even the Delaware, it is better to make two or three.

In layering the Scuppernong and its sister varieties, lateral branches are left to make the tops. These, at the time of layering, are cut back to eight inches, all on the same side of the vine, the laterals not closer than a foot apart. Vines on arbors, beside walls, on the sides of houses, or in greenhouses, are more conveniently layered in pots or boxes of soil, an operation that requires a little ingenuity, depending on the place in which the mother plant is growing.

Layering is a most convenient way to fill occasional vacancies

that occur by the death of vines in even the best kept vineyards. A newly set vine has little chance of living in competition with fully grown neighbors, but a layered plant from a near-by vine readily establishes itself. Such layering is best done by taking in early spring a strong unpruned cane from a plant in the same row and covering an end joint in the vacant place, leaving enough of the end of the cane to turn up out of the soil. This free end becomes the new plant; the following fall it can be separated from its parent. The second year the young plant should begin to bear. This method of propagation should be learned by every grape-grower, since, sooner or later, he will have to fill vacancies in his vineyard.

ON GRAFTING

Grafting the grape is relatively new. Theophrastus, the Greek philosopher, who had read eighty older books on farming before he wrote, and who lived some three hundred years before Christ, said: 'the grape cannot be grafted upon itself.' A hundred years later, Marcus Cato, who in his time grew grapes and made wine quite as well as any Frenchman of today, told how to graft grapes. Grafting grapes, however, did not become common until modern times, when it became necessary to grow European grapes on stocks resistant to phylloxera. Then it was found that vigor in vine and higher sugar content in the grapes might be obtained by grafting weak-growing grapes on more vigorous stocks. In the garden of the epicure, such grafting to obtain greater vigor and higher quality becomes a most important operation, one especially desirable in growing such choice wine grapes as Delaware, Iona, Diana, Dutchess, Ives, and Eumelan.

To *graft* is to insert a cion or bud of one plant in another, so that there will be a union between the two parts. The part of the plant represented by the cion or bud is supported and obtains its food elements from the part in the ground. As the cion grows, it retains all the characters in stem, leaf, flower, and fruit of the plant from which it came, except in the rare cases of graft hybrids: usually, especially in the grape, the part in the ground gives greater vigor to the top above the graft. The prime essentials of

grafting are two: First, the cambium layers of stock and cion must be bound together in intimate contact. Second, the graft must be so made that the cut tissues heal quickly and completely.

The limits within which grafting succeeds in grapes are unknown. Presumably any grape, whatever the species or variety, may be grafted on any other grape, though the less closely species are

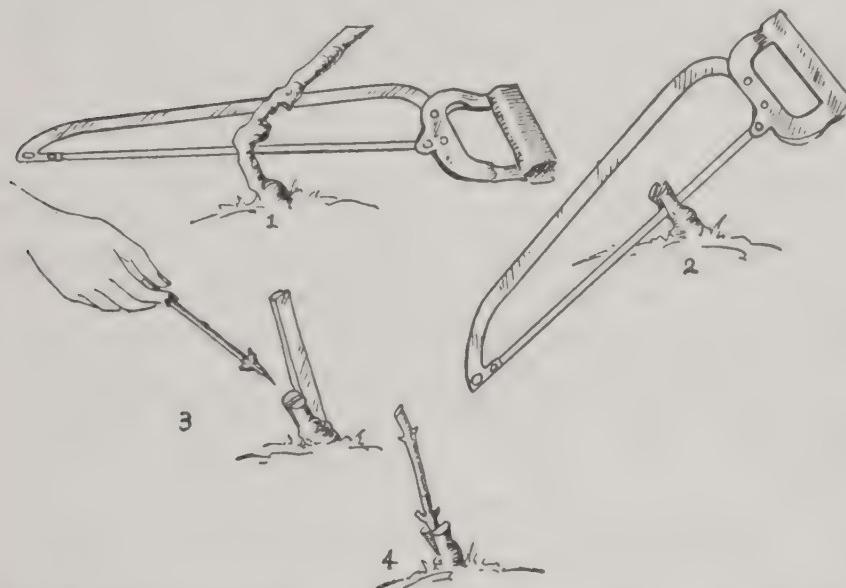


Fig. 8. Vineyard grafting: 1, Cutting off at ground level; 2, Sawing the cleft; 3, Wedging open cleft for receiving cion; 4, Graft completed ready for mounding.

related the greater the difficulty. Thus, it is found that varieties belonging to *Vitis rotundifolia* do not unite well with all the grapes of the very different northern species.

VINEYARD GRAFTING

The simplest method of grafting the grape is to do the work in the vineyard. The first operation in vineyard grafting is to remove the earth around the stock to a depth of two inches. The stock is then squarely cut off at the surface of the ground and a cleft is made in the center to the depth of two inches with a sharp grafting knife or with a thin-bladed saw. The cion is cut with two buds,

and a wedge is made at the lower end; then, the cleft in the stock being held open with the grafting knife, the two parts are joined. The several operations are shown in Figure 8. If the stock is large the graft need not be tied, but in young vines it is better to tie the graft, using raffia or yarn. Grafting wax is never used in field grafting; it suffices to mound the graft to the top of the cion with earth. The pressure of the upward flow of sap is so great that wax does not stay in place long. During the summer, snip off roots from the cion and sprouts from the stock.

BENCH-GRAFTING

For large vineyards, it is much better to use bench-grafts than to graft in the field. In this method cions of the variety wanted are grafted on cuttings or roots of the stock desired. In bench-grafting better unions are obtained, a fuller stand of vines is assured, and time is saved. It is such a neat, tidy operation, and is so easily done that every grape-grower, no matter how large his vineyard is to be, will find pleasure and profit in knowing how to make bench-grafts.

Success in bench-grafting depends on good cuttings of stock and cion. The cuttings should be about a third of an inch in diameter, and the two parts must match exactly. They may be taken from the two parent vines any time during the dormant season up to two weeks before buds swell in the spring. The wood must be kept cool and moist, which is best done by covering them with moist sand in a cool cellar.

In preparation for making the grafts, the stocks are cut in lengths of ten inches. The cut at the bottom is made through a bud in such a way as to leave the diaphragm. The top cut is made as near ten inches from the bottom as possible, leaving about an inch and a half of wood above a bud for convenience in grafting. The stock is then disbudded, taking both visible and adventitious buds, the latter of which are indicated by woody enlargements, to keep down the number of suckers.

Cions are cut with but one bud each, so that the unions are all at equal depths below ground when set in the nursery. The cion

is cut with about two and a half inches of internode below the bud and a half inch above. A sharp thin-bladed knife is indispensable in bench-grafting.

Stock and cion cuttings should be graded before the two parts are put together, to ensure perfect unions. It suffices to grade by the eye in large, small, and medium diameters. Of the several methods of bench-grafting that called tongue-grafting is best. This operation is as follows:

Make the cuts of stock and cion with a sloping cut, both at the same angle, after which a split or tongue is made in the middle of each. The object of the tongue, of course, is to hold the two parts together securely; also, by this method the maximum amount of the cambium layers are in contact. The cuts are made by single quick motions of the hand. There must be no paring, which would leave a wavy surface, making it hard to keep the parts in close contact. The tongues must be made by cutting and not by splitting, and the knife should not follow the grain of the wood. When the cut is made, the knife is bent over to open out the tongue.

The stock and cion are now fitted together, and, if all has been well done, there will be no cut surface visible. It is better that the points should not quite reach the bottom of the cut surfaces, as the union is then more complete, and the cions will be less liable to throw out roots.

No matter how well made the grafts are they will not hold together in subsequent operations unless tied. The best tying material is No. 18 knitting cotton, balls of which must be soaked in melted grafting wax for several hours. A good wax for this purpose is made by melting together one part tallow, two parts beeswax, and three parts resin. This waxed string is passed twice around the point of the cion, and then with wide spirals is carried to the point of the stock, after which it is fastened firmly with two more turns, the end of the cord being passed under the last turn. Figure 9 shows better than words how the work is done.

If the grafts are to be planted at once they may be laid in boxes and covered with damp cloths. It is better to keep them several weeks before planting, however, to give the grafts time to callus

over. In this case it is well to tie them in bundles of ten each, for convenience in handling. If the bundles are larger, those in the middle may mold or become dry.

To keep these bundles of bench-grafts, they should be stratified in a callusing bed where moisture and temperature can be controlled. Such a bed can be made of clean sand in a box in the woodshed. The bottom of the bed is covered with two inches of

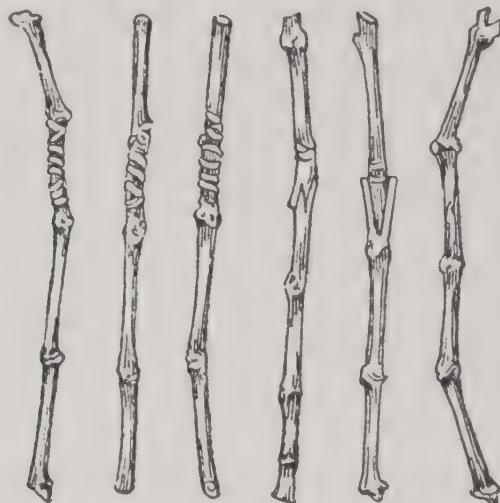


Fig. 9. Bench-grafted cuttings of grape, showing both the cleft-graft and the whip-graft.

sand. The bundles of grafts are placed in an inclined position at one end of the box, cions uppermost, and covered with sand to a thickness of two inches above the bundles. The sand should be moist but not wet and the temperature should be kept at 50° F. or a little lower until March or April, when 70° is better.

By the end of April, after four weeks of the warmer temperature, the union should be well cemented. At this time roots from the stocks and shoots from the cions should be an inch long—if longer, the temperature has been too high or the sand too wet. Long shoots or roots may be broken off without much harm. The grafts are planted in garden rows much as recommended for cuttings, and are given the same care. Suckers from the stocks should be removed. By autumn the vines are ready to go in the vineyard.

STOCKS FOR GRAPES

Phylloxera, a tiny root-and-foliage insect on all American grapes, made its appearance in the vineyards of France in 1861 and spread with unparalleled rapidity. Soon the insects were so numerous and so widespread that the very existence of the grape in the Old World was threatened. Later, phylloxera became quite as great a menace to the vines of California.

Finally, it dawned on European vineyardists that the phylloxera is not a serious pest in eastern America, its habitat, and that vineyards might be saved by grafting *Vinifera* grapes on the roots of immune American species. Soon, both in Europe and California, through the use of resistant stocks, phylloxera was under control. Resistant stocks, in their turn, brought new problems, most of which have now been solved.

The wild vines of a species are always seedlings and very variable. The first vineyards on resistant stocks were grafted on wild vines, and the results were unsatisfactory because of the variability in the vigor of the stocks. Also, there was difficulty in grafting, since some seedlings were stout, others slender. Again, it turned out that some species made much better stocks than others. The task of selecting varieties of the several species that were resistant, vigorous, and suitable in other characters that fit them for good stocks, was difficult; but in the years that have followed, several have been selected that are recognized as best for the various regions in the world where grapes are grown.

All this is of little importance to growers of American grapes in eastern America, or would be had it not been discovered that most of the cultivated varieties of American grapes are more vigorous, more productive, and the grapes somewhat better in quality when grown on some of the stocks used by growers of European grapes to control phylloxera. So, while it is not yet a common practice in eastern America to plant commercial vineyards on other than their own roots (though without doubt it would pay to do so), the man who grows grapes for his own table and wine cellar might be

glad to get more and better grapes from his vines by growing them on suitable stocks.

Fortunately, there has been experimental work and some practice in vineyards to guide him. As long ago as 1902, the New York Agricultural Experiment Station began experiments which have been carried on down to the present time in growing a number of varieties on various stocks. The first and most extensive experiment was carried on for eleven years, 1902 to 1913, the results of which were published in Bulletin 355. In this experiment, in the Chautauqua Grape Belt in western New York, twenty varieties were grown on three different stocks.

The varieties were Agawam, Barry, Brighton, Brilliant, Campbell Early, Catawba, Concord, Delaware, Eaton, Goff, Herbert, Iona, Jefferson, Lindley, Mills, Niagara, Regal, Vergennes, Winchell, and Worden. (These were the favorites of forty years ago, of which only five, Catawba, Concord, Delaware, Iona, and Niagara, would be planted now.) The three stocks were Rupestris St. George, Riparia Gloire, and Clevener. The same number of the twenty varieties were planted on the three stocks and an equal number on their own roots.

Throughout the experiment the grapes on the three stocks were better in respect to vigor of vines, productiveness, and quality. As an example of the differences in yield, a summary of the yields for 1911 may be given. In this year, an average of all the varieties on own roots was 4.39 tons per acre; on St. George, 5.36 tons; on Gloire, 5.32 tons; on Clevener, 5.62 tons. The greater yields on the grafted vines were the result of more bunches, larger bunches, and larger berries.

The grapes on Gloire and Clevener ripened a few days earlier than those on their own roots; on St. George, a few were retarded. Changing the time of harvest may be very important in grape regions where there is danger of early frosts. Sometimes one would like to retard the ripening of early grapes.

In growth ratings on varieties on the different roots, those on their own roots were rated in vigor at 40; St. George, 63.2; Gloire, 65.2; Clevener, 67.9. To be sure, both yield and vigor may have

varied because of different adaptabilities or other factors, as well as because of influence of stock on scion. However, much the same results have been obtained in other eastern grape regions, so that it may be taken as a fact that these three stocks are better than own roots for eastern American vineyards. Of the three, Clevener, a good grape on its own roots and one usually to be obtained from nurserymen, is the best.

4. Climates, Sites, and Soils

WHEREVER there is a house and a garden there is a place for the grape. The vines will cover an ugly boulder and produce choice fruits; grow on a naked wall or fence and make either beautiful and fruitful; mask an eastern, southern or western front of a house or out-building; hide a court where washings are hung; make attractive a poultry yard; in all these places, it will grow luxuriantly and profitably. Almost any man in America can sit under his own vine, if not under his own fig tree.

Those who have written about grape-growing in America have said so much about 'regions' that many who have home orchards of other fruits do not have a vineyard, because they think of the grape as a plant having very special requirements. To be sure, one may name a dozen or a score of large areas of this or that soil, with this or that climate, which may be called the chief grape-growing regions in North America. One thinks at once of California as the vineyard of the continent or of the earth; of the Finger Lakes region of western New York, so productive of good wines and Champagnes; the Chautauqua Grape Belt is a third such area; the Niagara region on both sides of the Niagara River is a fourth; and there are lesser areas in Ohio along Lake Erie, in western Michigan, in Missouri, and in Virginia where grapes are or have been grown extensively. These are places where climate and soil are exceptionally favorable; but, though nature may not pour out her favors so freely in other parts of the land, the difficulties are neither numerous nor hard to overcome in growing some grapes in any garden soil.

To bound the regions where vineyards are fruitful is less impor-

tant than to understand why they exist. Any grape-grower will tell you that success is due in largest measure to three attributes of all viticultural regions in about this order: a suitable climate, a proper soil, and relative freedom from insects and fungi. Everyone who contemplates setting a vineyard should examine these requirements critically before beginning his work, remembering that each provides a gamble as exciting as any in which a game may be lost or won.

CLIMATE IN GENERAL

The phases of climate, as it governs grape-growing, are six: length of season; seasonal sum of heat; humidity in the growing season; dates of spring and autumn frosts; winter temperatures; and air currents. The grape-grower may be at the mercy of any one of these elements of weather; or, if any one of them is very unfavorable, his vines may be dingy and unhappy, so that he can seldom harvest a finely finished product.

No one should plant a vineyard without giving careful consideration to the length of time it takes the varieties he wants to plant to mature—every grape has a length of season of its own. It would be folly to plant early northern grapes in the South, where they would pass rapidly from maturity to decay. It would be equally foolish to plant in the North late-maturing grapes which, even though hardy in vine, would not ripen sufficiently well to make the grapes palatable to eat out of hand or to make good wine; lastly, when the season is too short, neither the wood nor the buds ripen well enough to withstand a cold winter.

Daily range in temperature, also, has much to do with the ripening of fruit, wood, and buds. This range is often quite independent of latitude, being somewhat dependent on the lay of the land, on soils filled with rocks that hold heat, and, as we shall see, on proximity to bodies of water. Cold nights may offset warm days; rain, fog, and humidity in the air may delay maturity. A sunny aspect in the lay of the land is a great help in ripening fruit and wood in doubtful grape climates; even more, a warm, dry, gravelly or stony soil ensures ripening of all parts of the vine, and further assists climate in ensuring good grapes. Lastly, as the vintage

draws near, an unclouded sun, if the air circulates freely, even if the nights are cool, helps to produce good grapes.

Not many grape-growers can or will calculate the seasonal sum of heat during the summer, upon which all plants are dependent. The theory is that the buds of any species of plants start growth when the daily temperature averages a certain degree, and that the sum of the mean daily temperatures must reach a certain amount before the grapes ripen. Of course this sum varies greatly with different varieties. Roughly, grape buds begin to swell at from 50° to 60° F. Grapes should be planted, speaking very generally, only where there is a growing season of from May to September, each day of which has an average temperature of more than 50° F.

SUN AND RAIN

Grapes thrive best in warm, sunny, dry climates. They grow better than any other fruit in regions where the summer rainfall is comparatively light. The vines make a poor growth, set a small crop, are troubled with diseases, and the grapes are of poor quality, especially in the matter of sugar content, if the summer is damp and cloudy. Cold, wet weather at blooming time is always to be feared, as, if extreme, it is fatal to the proper setting of fruit; and moist, foggy warm weather as the grapes begin to ripen is another calamity to be feared, since such weather favors the growth of fungi. The Keuka Lake grape region in western New York, long celebrated for its wines, especially its Champagnes, has a climate so warm and dry that nearly every year is a vintage year—the envy of European wine-makers.

The grape has a thousand enemies, insects, fungi, and bacteria. If the weather favors these pests—hot dry weather for insects, or moist warm weather for fungi—the grape-grower must take extra care in spraying and sanitation to keep these enemies down. If his grapes are ever so fine at the beginning of the harvest, a stretch of wet or cold weather may ruin his crop, so that his season's labor may have been in vain. In regions where the sun in spring and autumn is covered long in mists and clouds, the grape cannot be

kept free from fungi. The weather near the cool, foggy Atlantic is plainly evil, considered from the standpoint of the grape.

The best wine year remembered in western New York was one in which the harvest followed an August so hot and dry that grape-growers were in despair. Then, two weeks before grapes began to ripen, there came several days of warm rain, and soon the grapes were turgid with growth. Sugar enough had formed in the dry August to give the grapes quality and the long rain made quantity. Grape-growers and wine-makers reaped a golden harvest.

Grown for wine, the common use to which grapes the world over have been put since Noah's time, the grape needs continuous sun to increase the sugar content and that in turn alcohol. But grapes, especially the American varieties, can be grown in shade and will ripen a fair crop of grapes refreshing to eat out of hand, though not often suitable for wine. The grape is, of all fruits, the only one that can be planted on arbors, summer houses, fences, and on the sides of porches, houses, or in other somewhat shaded places; though, so planted, neither high quality nor great quantity can be expected.

FROSTS

He who would grow grapes must note well the average dates of the last killing frost in spring and the earliest freezing frost in autumn. Even in favored grape regions, whether in California, Missouri, Michigan, Ohio, or New York, grape crops are occasionally ruined by spring or autumn frosts. Once a vineyard is planted, little can be done to protect it from the frosts. Wind-breaks as often favor the frosts as the grapes; and smudging or heating is too expensive, though the small owner might save his crop with a smudge or heat. Happy is the grape-grower who has his vineyard in a warm thermal belt near water or on the slope of a hill. Otherwise, the only other precaution to be taken in a frosty region is to plant varieties that bloom late and ripen early.

Every grape-grower holds his breath, no matter where the vineyard grows, in spring or fall, until the danger of frosts has passed. The grape will stand a little frost without serious damage. From the time buds open until the vines are in blossom, two degrees of

frost will do little damage; new leaves and the tender tips of shoots may be touched by such a frost, but the recuperative powers of the grape are so great that little damage is done. Blossoms will be killed by two degrees of frost, but the grape blooms so late that hardy northern varieties are seldom caught by frost in blossoming time. Nature has provided the grape with secondary buds which put forth when growths from primary buds have been killed by frosts.

A frost of two degrees in the ripening period takes off the foliage but does little damage to the crop, though the sooner the grapes are picked after such a frost the better. Grapes may be used for wine, even if caught by four degrees of frost, if picked and pressed immediately. The drawback to this procedure is that the grapes are seldom quite ripe when caught by a frost, and are almost certain to be low in all-important sugar. A frost of two or more degrees in autumn brings growth and the maturing of wood to a dead stop.

In regions where frosts occur often in either spring or autumn, it helps some to train the plants high, as in the Umbrella Kniffin system. The layer of air near the ground is coldest, and high training keeps shoots in the spring and ripening grapes in autumn out of this low-temperature area.

FREEZES

One labors under great difficulties when he plants a vineyard in a region where winter-killing is probable. A good rule is to plant only in localities where wild grapes grow. Varieties of native grapes are seldom killed by cold where the thermometer does not go below -15° F., though the tender Viniferas are at the mercy of the winter where the mercury goes below zero. He who wants grapes, however, can have them by hook or crook, wherever the hardiest orchard fruits are grown. He can select the hardiest varieties, such as Beta, Ironclad, or Janesville, hybrids between Labrusca and Vulpina, which grow far to the north. Then, again, he can lay the vines down and cover them with earth, as recommended for tender Viniferas in the chapter on European grapes.

A safe procedure with the grape is to plant only varieties that will withstand all weather to which the garden is subject. The main plantings, at least, should be hardy enough to stand a test winter or a test summer. It may add spice to the venture of growing grapes to plant a few doubtfully hardy varieties; but nothing so takes the heart out of the owner of a vineyard as does finding dead vines just as he looks for his first full crop.

After a winter freeze, the grape-grower need not give up in despair. If, animated by faith and hope, he does what he can to save his vines much can be done. If the tops of the vines only are killed, as is usually the case, the vineyard can be rejuvenated in the course of a year or two. Prune the vines to one or two nodes below the dead parts. If the whole top is killed, cut back to the ground and try to renew the plant from suckers, as can be done. In either case, the vineyard must receive the best of care in the way of cultivation. Usually, nitrogenous fertilizers have a tonic effect on the new growths.

WINDS

It is important with the grape to note the direction, force, and frequency of winds. Air in motion often means life to the grape in the way of preventing fungous diseases; also, it helps to check frosts. Winds are beneficial when they bring warm or dry air to dispel fogs and humidity. It is a fundamental in growing this fruit that the air must move, whether from hill, mountain, cañon, lake, river, or sea. A dead level or a pocket in hilly land where the air does not move is no place for the grape. To be sure, winds may be evil; as, when too cold, too strong, or when they bring hail season after season, hail being about the worst of all natural calamities. Having planted his vineyard, the grape-grower must take the winds as they blow.

Hail-storms are always brought by wind, usually a roaring one. They are almost always local phenomena, and can be avoided by planting in places where they seldom occur. Hail almost never falls within a mile of a deep or large body of water, even though a little farther away it may be expected every summer.

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Lightning almost always precedes a hail or a heavy fall of rain in wind-storms. Every vineyard, with its posts and wires, is a field of lightning rods, and almost every vineyard, sooner or later, is struck. Sometimes lightning runs along a whole row, killing or injuring most of the vines. As with hail, nothing can be done about lightning. Many owners of large vineyards carry insurance against wind, hail, and lightning—which, of course, is available to owners of small vineyards, too.

As a preliminary to planting the prospective grape-grower should try to synchronize all important phases of climate with the life events of the grape. The necessary weather data can be obtained from weather bureaus, or, better still, by keeping one's eyes open for a few years in the study of the weather. The state experiment station in most states can furnish the average dates of blooming and ripening of the varieties of this fruit commonly grown, or can furnish lists of grapes that are adapted to local climates.

THE SITE

One sees at once that the local position of the vineyard—its so-called site—is very much worth while keeping in consideration in casting about to find the best place to plant. In a small way, a man may make his own climate by his care in selecting the bit of land where his vines are to be set. Try to plant on the part of your property where you can get the maximum amount of sun and air and the least amount of moisture, cold, and frost—factors discussed a few pages back. Choose, if possible, land near water, on a hillside.

It is not a matter of chance that so many of the best grape regions in the East—or for that matter in the world—are bounded by water. In New York, Canada, Pennsylvania, Ohio, and Michigan, grape districts are on the Great Lakes or on inland lakes, such as the Finger Lakes in western New York. In Europe there is the wide Rhine and the winding Moselle, from the banks of which come the world's best white wines. The reasons for the partiality of the grape to lands on the shores of lakes and rivers is apparent: the temperature of sites near large bodies of water is warmer

in winter and cooler in summer; there are fewer late spring and early autumn frosts; and there are off-shore currents of air at night and in-shore breezes during the day, which dry the foliage and fruit so that spores of fungi do not germinate easily.

The good effects of water on vines are felt at distances of four or five miles, seldom further. If the shore lands of bodies of water are low and level, benign influences change to evil ones: the water then brings fogs, dews, and humidity, so that leaf and fruit are early attacked by fungi. Near water, as elsewhere, the grape does best on high and hilly land.

Virgil, the poet of the vineyards and wines, long ago wrote: 'Bacchus is partial to broad sunny hills.' Universally we associate grape-growing with rugged lands. In Italy the slopes of Vesuvius are planted with grapes; the hills of Madeira are covered with vines; Burgundy comes from rolling lands in France; all the world knows of the vine-clad banks of the Rhine; the best vineyard lands in California are rolling; the best vineyards in eastern America are on the slopes of hills and escarpments. These examples show how desirable rolling lands are for grape-growing—even steep hillsides are favorable. Choose, if possible, a rolling site for your own vineyard.

It is a source of wonder to visitors to the famous grape lands of the earth when they see how steep and lofty the slopes of many of them are, yet kept in perfect condition. Often in stony, shallow soils on the hillsides of French and German wine regions, where the soil must be carried up on human backs, one sees vines at the very height of luxuriant growth. In the famous Keuka Lake country, the hills are so steep and the soil is so stony that special tools and the most arduous labor are required. Yet every autumn Keuka Lake vineyards are loaded with clusters of ripening Catawbas and Delawares from which, blended with Iona, Diana, Dutchess, Elvira and other choice sorts, Champagnes are made. Plate vii shows a stony hillside vineyard on Keuka Lake.

A further condition to keep in mind in choosing a spot to plant a vineyard is the direction of the slope of the land, though for a

home vineyard too much importance need not be attached to a particular exposure. With the admission that good grapes may be grown on lands exposed to any point of the compass, let us look at the slight advantages in planting grapes on one exposure or another.

For early grapes and very late ones, it is a little better to plant the vineyard on an exposure looking southward. Select a north or west slope to retard blooming, thus helping the fruit to escape late spring frosts. Frost damage is usually most harmful on eastern slopes, since the rays of the rising sun soonest strike the plants and thawing is more rapid than in other exposures. Near bodies of water, the slope towards the water is best, regardless of direction.

SOILS FOR GRAPES

Soil is the supreme factor in grape-growing. Important though climate is, soil dominates. A vineyard on one side of the road may be excellent; on a slightly different soil on the other side, miserable. Europeans learned this centuries ago; Americans have it yet to learn. In any of the European grape-growing countries are to be found vineyards in which the soil is so precious that vines are planted to the edges of the roads and in the shadows of buildings. If the soil in these vineyards washes down a slope, it is laboriously carried back. With such vineyards, American vineyards cannot compare.

Of these European vineyards, Ernest Peixotto, in his admirable *A Bacchic Pilgrimage*, writes:

So valuable, indeed, is this soil that when the vine-dressers leave their work in the evening, they carefully wipe off their sabots, so that not an ounce of the precious earth will be lost upon the road, even as the gold-workers, when they quit their work, comb out their hair and clean their fingernails so that not a bit of the precious metal will be lost.

We shall begin to grow better grapes and make better wines in America when we place some such value on grape soils as the French and Germans do.



PLATE VII. A. A stony vineyard on Keuka Lake
B. Pickers in a hillside vineyard on Keuka Lake



PLATE VIII. A. Contour planting on the Hudson River

B. A vineyard of Concords, 30 years old, near Fredonia, New York

Virgil, writing in Christ's time, gave good advice on selecting soils for the grape:

A free loose soil is what the vines demand,
Where wind and frost have help'd the lab'lers hand,
And sturdy peasants deep have stirr'd the land.

All grapes of all species seem to have an affection for gravels, flints, slates, or stones. It would almost seem that vines squeeze nourishment from stones to give their fruits flavors and perfumes. The best grape soils in eastern America are found about Keuka Lake in the Finger Lakes region of New York. Yet the bluffs of this lake are so stony and the soil so shallow and so lacking in plant food that growers of any other fruit would hardly take it as a gift.

That grapes are fond of gravels and stones is true in Europe as well as in America. Graves, one of the good wines of France, produced in great abundance, takes its name from *gravier*, or gravel, the dominant type of soil in the wine districts of southern France. Gravelly and stony soils radiate a gentle warmth when heated by the sun, giving the bottom heat, so necessary to the growth of the vine. This bottom heat puts the quintessence of flavor and aroma in grapes.

It may be laid down as a rule that grapes will not thrive or produce crops of good quality in wet soils. Soils naturally well drained are best; otherwise the land must be drained artificially. The water-table should be at least two feet from the surface. Even on hillsides, drainage may be necessary, since the subsoil may be retentive of moisture that seeps in from higher levels. But of course drainage is not a cure-all. The writer once had charge of an experimental vineyard, the soil of which seemed to need drainage, yet when tiles were laid there was little difference in quantity or quality of the crop; the land, drained or undrained, was not well suited for grapes.

Wherever grapes are largely grown in eastern America, as has been said, vineyards are planted on bluffs and steep slopes. If these steep lands have long been set to grapes, one may almost

always find many abandoned vineyards. Most of the land in these old plantings has been gullied and washed down to hardpan by heavy rains. In Germany or France, the soil would have been carried back; but never in America have vineyardists replaced soil washed down hillsides. Happily, many grape-growers are now planting and cultivating vineyards in accordance with the natural contours of the land, work supervised by federal or state experiment agencies. Contour planting is the only solution for vineyard soils that wash and gully. Plate VIII shows contour planting on the shore of the Hudson River.

As a last word about soil, it must be said that some of its attributes are not analyzable. That is, some varieties of grapes will grow in soils where others cannot be made to grow. As might be expected, varieties of the several species have quite distinct adaptations to soils. The Viniferas prefer certain types of soil; the Labruscas others; the Vulpinas still others; and so on. Much can be accomplished in growing varieties on soils uncongenial to them by grafting on varieties that thrive on a particular bit of land. Always to be remembered in planting a vineyard, there are varieties that thrive on a great variety of soils: Concord, Niagara, Delaware, and some of the newer grapes, especially selected because they thrive under many conditions, are examples.

CHEMICAL CONSTITUENTS OF SOILS

The novice in grape-growing usually rushes to the nearest experiment station with a sample of soil to be analyzed. The results are disappointing. The chemist can tell him what is in the soil but not what grapevines choose. From every analysis of soils made from the Chautauqua Grape Belt, it would seem that the soils from this region are better than those about Keuka Lake or in some parts of the Hudson River Valley. But from the grapes of the last-named regions, much better wines are made than from those of the first, in the vineyards of which the yields are much higher. Without doubt, the physical texture of a soil is more important than, within reason, is the chemical constituency.

One is often tempted to generalize and say that this or that

variety will not grow well on limestone soils; yet a few miles away he may find the same varieties producing crops of highest quality from which good wines are made. A common generalization is that red soils, supposed to contain much iron, are best for red wines; yet this is by no means always the case and it is even doubtful if it is usually true. For a century, European chemists have been studying grape soils, but not enough has been learned to make even broad conclusions on what chemicals should be found in vineyards from which good wines can be made.

French and German chemists do agree on three types of soil on which good wine grapes cannot be grown. First, a soil in which sand predominates is not a good grape soil, though a sandy soil in which there is a good deal of clay or gravel may be suitable for wine grapes. Second, there must not be too much humus—so necessary for most cultivated plants—in vineyards. Third, soils fertile enough to grow good farm crops are seldom if ever good lands for vineyards. To all these conclusions of European chemists and viticulturists, their fellow workers in America would fully agree.

5. Planning for a Vineyard

SUCCESS in growing grapes depends largely on forethought exercised several years before the results can be seen. The span of life of a vineyard may be as long as that of the person who plants it. An undertaking so permanent deserves careful planning. Inevitably, one gambles in planting any crop; but planning the vineyard may eliminate some of the hazards.

A vineyard should be planned not only in the mind, but the plan should be put on paper, from which, in due course, it can be transferred to the land. The whole project should be clearly outlined; the outgo and income should be carefully calculated: so much land, so many grapes; such and such varieties for table use, others for wine; so many pounds of grapes, so many quarts of wine; what tools will be needed and what the kinds.

THE SIZE OF THE VINEYARD

The question where to plant was discussed in the preceding chapter, but nothing was said about the size of the vineyard. Just as the tailor must cut his coat to fit his cloth, so the gardener must often plant his vineyard according to the land in hand. Virgil wrote: 'Praise great estates; farm a small one.' This is good advice to those who are planting grapes. If one is a little short on land, or capital, or both, the size of the vineyard may be summed up by 'A little garden with a row of grapes.' In particular, the novice should make a modest beginning. If the chief use of a vineyard is to grow grapes for wine, a quarter of an acre is a big vineyard. With any sort of success, one should grow annually at least

a ton of grapes on a quarter of an acre of land. Out of a ton of grapes, even in a wasteful home winery, a man should be able to make some six or seven hundred bottles of wine. Who could want more, even with the new friends a good wine cellar would bring him?

Still, one wants elbow room in his vineyard, with boundaries sufficiently remote to avoid the feeling of oppression which one who really loves the land has when neighbors crowd. Also, the desire for more room grows as seasons pass and success becomes assured. The garden plot is not enough; there is a burning desire to increase possessions, to own an acre of grapes from which one may supply all his friends with fruit and wine—or help pay expenses by sales. Alas, too often this desire cannot be gratified. The next-door neighbor, who owns a sordid potato patch will not sell, but takes pleasure in holding his land under your nose. It is well, therefore, in planning your vineyard to start with enough land. With a little more money at the start you can furnish yourself with ample elbow room for the future.

The owner of a small vineyard has quite a different attitude toward his plantation than does the owner of a commercial place. The latter is the commander of a phalanx of vines, and must ever consider his army in the gross. In the home vineyard, with which this treatise is chiefly concerned, individual vines are the units of care; the vineyardist is the loving friend to every vine, giving each a pat of care at every opportunity, or ruthlessly pruning, if need must be. In the small vineyard, the owner knows every stone, shallow spot, undrained hollow, of a bit of soil sacred because of great fertility, treating the tenants of each variation with the special treatment needed. The grower *en bloc* is of necessity a socialist; the home-growing epicure must be a vehement individualist.

Therefore, in making a plan, have in mind the exact size of what you intend to plant. How big is an acre, a half acre, a quarter acre, or a house lot? How many kinds of grapes will you plant and how many of each variety? What distances apart will be the rows and vines? How will you arrange the several varieties? Do

TABLE I. COST OF PRODUCTION PER ACRE OF GRAPES GROWN IN A VINE-YARD IN WESTERN NEW YORK

ITEMS	1915	1916	1917	1918	1919	5 YEAR AVERAGE
Interest on investment.....	\$18.00	\$18.00	\$18.00	\$18.00	\$18.00	\$18.00
Taxes and insurance.....	.78	3.80	4.61	5.25	5.92	4.47
Fertilizer, manure, and lime.....	8.50	4.65	6.87	3.08	8.50	6.31
Posts, wire, wire-ties, twine, staples, tools, etc.....	4.37	.14	1.64	3.92	2.23	2.46
Green manure seed.....	....	.36	....	1.31	1.87	.71
Spray materials.....	2.16	....	....	.94	.91	.80
Vine replacements.....	.87	.59	.59	.84	1.75	.93
Total maintenance expense.....	\$36.68	\$27.54	\$31.71	\$33.34	\$39.18	\$33.68
Pruning.....	\$2.13	\$3.56	\$3.50	\$3.94	\$4.37	\$3.50
Brush disposal, pulling, poling, and burning.....	2.29	1.81	3.11	4.28	3.25	2.95
Trellis repair, driving posts, fixing braces and stretching wire.....	3.71	1.52	2.37	1.82	5.75	3.03
Tying, spring.....	1.45	1.72	1.35	2.70	3.70	2.18
Plowing, single horse.....	.66	.66	....	1.35	1.35	.80
Plowing, team.....	1.00	.94	.81	1.50	1.50	1.15
Horse hoeing.....	.66	1.40	1.18	1.70	3.00	1.59
Hand hoeing.....	2.20	.60	1.62	.97	5.40	2.16
Harrowing.....	3.81	6.50	4.25	10.10	5.50	6.03
Clipping tops.....	.26	.34	.37	.41	.50	.38
Summer tying.....	.72	1.07	....	.75	....	.51
Spraying, labor.....	2.42	....	....	1.37	1.00	.96
Green manuring, labor.....	....	.25	....	.19	.25	.14
Miscellaneous, suckering, mowing weeds.....	3.75	.75	1.44	.75	....	1.34
Total labor expense.....	\$25.06	\$21.12	\$20.00	\$31.83	\$35.57	\$26.72
Total upkeep expense.....	\$61.74	\$48.66	\$51.71	\$65.17	\$74.75	\$60.40
Harvesting, labor, teaming, cartage, and containers.....	\$13.87	\$12.10	\$21.36	\$14.85	\$29.47	\$18.33
Total cost production.....	\$75.61	\$60.76	\$73.07	\$80.02	\$104.22	\$78.73
Yield, tons per acre.....	2.66	2.47	2.72	1.18	3.72	2.55
Selling price per ton.....	\$38.50	\$50.63	\$42.08	\$112.00	\$95.00	\$67.64
Net profit per acre.....	\$26.80	\$64.29	\$41.38	\$52.14	\$249.18	\$86.76

TABLE II. COST OF PRODUCTION PER TON OF GRAPES GROWN IN A VINE-YARD IN WESTERN NEW YORK

ITEMS	1915	1916	1917	1918	1919	5 YEAR AVERAGE
Interest on investment.....	\$6.77	\$7.290	\$6.62	\$15.25	\$4.840	\$8.15
Taxes and insurance.....	1.05	1.540	1.69	4.45	1.590	2.06
Fertilizer, manure, and lime.....	3.20	1.880	2.52	2.61	2.280	2.50
Posts, wire, wire-ties, twine, staples, tools, etc.....	1.64	.056	.60	3.32	.600	1.24
Green manure seed.....	....	.145	....	1.11	.500	.35
Spray materials.....	.81	....	....	.80	.244	.37
Vine replacements.....	.33	.240	.22	.71	.470	.39
Total maintenance expense	\$13.80	\$11.15	\$11.65	\$28.25	\$10.52	\$15.06
Pruning.....	\$0.800	\$1.440	\$1.280	\$3.340	\$1.170	\$1.606
Brush disposal, pulling, poling, and burning.....	.860	.730	1.140	3.620	.870	1.444
Trellis repair, driving posts, fixing braces, and stretching wire.....	1.390	.610	.870	1.540	1.540	1.190
Tying, spring.....	.550	.696	.496	2.280	.990	1.002
Plowing, single horse.....	.248	.220	....	1.140	.360	.393
Plowing, team.....	.370	.380	.300	1.270	.400	.544
Horse hoeing.....	.248	.566	.433	1.440	.806	.698
Hand hoeing.....	.827	.240	.595	.820	1.450	.786
Harrowing.....	1.430	2.630	1.560	8.560	1.470	3.130
Clipping tops.....	.105	.137	.136	.346	.134	.171
Summer tying.....	.270	.430	....	.635	....	.267
Spraying, labor.....	.910	....	....	1.160	.268	.467
Green manuring, labor.....	....	.100	....	.160	.070	.066
Miscellaneous, suckering, mowing weeds.....	1.370	.300	.520	.630	....	.564
Total labor expense.....	\$9.38	\$8.48	\$7.33	\$26.94	\$9.53	\$12.33
Total upkeep expense.....	\$23.18	\$19.63	\$18.98	\$55.19	\$20.05	\$27.39
Harvesting, labor, teaming, cartage, and containers.....	\$5.21	\$4.90	\$7.85	\$12.58	\$7.92	\$7.69
Total cost production.....	\$28.39	\$24.53	\$26.83	\$67.77	\$27.97	\$35.08
Yield, tons per acre.....	2.66	2.47	2.72	1.18	3.72	2.55
Selling price per ton.....	\$38.50	\$50.63	\$42.08	\$112.00	\$95.00	\$67.64
Net profit per ton.....	\$10.11	\$26.10	\$15.25	\$44.23	\$67.03	\$32.54

some of the varieties need cross-polinization? What are the best polinizers? All these matters should be well considered before you begin planting.

THE COST OF A VINEYARD

To be sure, the cost must be kept within reasonable limits. It is an empty triumph to grow grapes by lavish expenditure. A vineyard is not praiseworthy if the crop costs twice as much as the grapes are worth in the market. The aim should be to grow the largest possible crop at the least possible cost of the very best grapes. The method of culture and the cost of culture should not be beyond the means of small farmers and gardeners.

Several experiment stations have published figures showing costs, of which those of the New York Agricultural Experiment Station, Geneva, New York, are as good as any. These figures were taken for five years, 1915-1920. They were published in Bulletin 479 of the Station. No doubt the costs would be slightly different at this time but not greatly so. If, as should be the case, the prospective grape-grower plans to do much of his own work, his expenses will be greatly reduced.

The cost of planting an acre of grapes may be roughly estimated as follows:

600 plants	\$90.00
Fitting land and marking	6.00
Planting	4.00
Cultivating, first season	8.00
Posts for trellis	30.00
Wire and staples	30.00
Putting up trellis	8.00
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	\$176.00

The cost now would be much greater and what it will be in the future one cannot even guess. The cost of planting a part of an acre would be proportionally higher.

THE BEARING AGE

To plant to the best advantage, one should know how long it takes the varieties he will plant to bear and how long the vines

will live. Some varieties take longer to go through their various life events than others. The age at which vines begin to bear, the most important factor to the grape-grower, varies from two to four years. A few precocious vines bear two years after setting in the vineyard; most varieties bear at three years; and a few do not begin to bear until they have been planted four years. None will be in full bearing, in the North and East at least, until the vineyard is ten years old, though all varieties will have given good crops before that age. These ages are modified by climate, soil, and the care given the vines, though nature cannot be greatly hurried by man.

No one knows how long a vineyard will live, or, at least, how long it is worth keeping alive. There are many individual vines in any eastern American grape region that are a hundred or more years old, and some Rotundifolias in the South are two or three hundred years old. Probably there are vines about the old missions in California that are more than a hundred years old, and the remarkable vine in the greenhouse at Hampton Court, England, mentioned before, is well along in its fourth century. There are vineyards in eastern America sixty and seventy years old. All the vines in a grape plantation of any size, more than a few years old, are not of the same age; for, in any well-kept vineyard, dead or injured vines will have been replaced. In home vineyards, where special care can be given to individual vines, the plantation should live longer than commercial vineyards. But many vineyards of old varieties will be replaced with new and better kinds every few decades.

WHERE AND WHAT TO BUY

Vines grown near home are a little better than those which come from a great distance. This is especially true if it gives one an opportunity to see the plants he is buying. In that case take vines of average size for their age—neither very large nor very small. Short, stocky, much-branched vines are better than tall spindling ones. Take only plants with well developed root systems. First grade plants, one year old, are better than those two years old, though a few weak-growing varieties may well be two years old.

Never buy three-year-old grapevines. Never buy from a tree agent unless you know the man well and the nursery for which he sells.

There are several characters to take into consideration in selecting vines. The roots and canes should be alive to the remotest tips. The vines should have a bright healthy look. The trunk diameter should be large enough to indicate vigorous growth in the nursery. Vines with internodes of medium length are better than those with very long or very short internodes. The wood must be mature, as indicated by color and firmness; immature wood is soft and green. There should be an abundance of roots with an ample spread.

Plan to buy from a reliable nurseryman. When a plant comes from a nurseryman, all can tell whether it is alive, but none can tell whether it will grow or not. None can tell whether it is true to name. If a vine does not live, a year is lost; if it is not true to name, several years. No wonder that the question 'Where shall I buy?' is so often asked by beginners.

Happily, state and federal laws provide that nursery stock be inspected for the most dangerous insects and fungous diseases. The buyer, therefore, need worry little about the healthiness of his plants. If there is suspicion that plants are badly diseased, even a small grower can call in an inspector.

Do varieties of grapes run out? It is rather commonly thought that they do. However, grapes, or any other fruit propagated from buds, grafts, or cuttings, do not run out. The grapes from the vines, wines from which made Noah drunk, would be the same now as when Noah planted the grapes.

Sometimes spraying is impossible. If so, plan to grow varieties immune to pests. There are varieties more susceptible, or more resistant to this or that pest than others. All good descriptions of grapes should tell the standing of the variety described in these respects.

A good many varieties of grapes are more or less self-sterile, and do not set full crops unless kinds are planted near them which blossom at the same time. Probably most grapes set fruit rather

better when pollen is available from another variety. Make sure, in your planning, that cross-pollination is provided for.

Keep in mind in all planning that every variety has limits in latitude. Select northern sorts for the North; southern sorts for the South. If the latitude is a little high or low for the general run of grapes, take that into consideration and select varieties most hardy to cold or heat, as the case may dictate. In trying climates or soils, plan to grow only varieties with great internal push, those known to have good constitutions. Such a choice is often at the sacrifice of quality; for, unfortunately, some grapes with high quality that one would very much like to grow are hard to suit in soil or climate. Perhaps some of these badly wanted grapes can be grown in home vineyards if they are given very special care.

ON GETTING ADVICE

It is well, in making these preliminary plans, to take a look through the vineyards of the region, noticing the excellencies and the faults. Seek the advice of the owners of good plantings. In this, the amateur can well go to successful professionals for advice. It is an asset of great value to have grape-growing neighbors with whom one can consult. To surpass all in the region round about in quality and quantity of grapes is breath to the nostrils of a grape-loving vintner. To make a better wine than that to be found in the cellar of any of one's friends is exaltation—the seventh heaven for any grape-grower.

The United States Department of Agriculture, agricultural colleges, and state experiment stations give help that is almost indispensable to those who engage in grape-growing. A letter to Washington or to your state institutions will bring bulletins or personal advice on nearly every phase of vine-culture—but not on wine-making: only California and New York dare, as yet, face the prohibition bogey. Several bulletins from California on wine-making are splendid, but the little that has been published by the New York experiment station at Geneva is so scant and fragmentary as to be hardly worth having.

The county agent, of which there is one in almost every agri-

cultural county in the country, can give much help. Call on him at every turn. He can probably help you a good deal in growing grapes, and his advice is usually to be relied upon. In wine-making, however, few agents if any can be of help; sooner or later, you may be the one to give the instruction, remembering that there is nothing better than 'A Jug of Wine, a Loaf of Bread' to gain friendship.

ON NURSERYMEN'S CATALOGUES

Another source of information and inspiration is the nurseryman's catalogue, though many of the descriptions of varieties must be taken with a grain of salt. Every well-written, well-illustrated catalogue begets enthusiasm, and as often as not enthusiasm begets a temper of mind in which imagination gets the better of judgment; too often the reader takes a flier in varieties that turn out badly. Still, what grower of plants will pass by catalogues of plants without reading them, confusing though they are, even to the experienced viticulturist? Here follow a few suggestions on the use of catalogues:

A variety is not described well unless the faults as well as the merits are mentioned. No grape is perfect and the customer ought to be told what the imperfections are. In particular, adaptations to soil, hardiness, and immunity to this or that disease or insect ought to be mentioned.

Varieties advertised as surpassing all others should be looked upon with suspicion. Any new grape surpasses its kind in only one or a few respects. Usually a new variety is earlier or later than similar sorts; the variety is better colored or better flavored; it suits some climatic condition better; is more vigorous or more productive; or is better for this or that purpose, as for shipping, or wine-making, or for culinary purposes, for roadside markets or general markets.

Old varieties are often introduced as new grapes. Thus, since they were first named: Catawba has been sold under 26 different names; Delaware, under 11; Herbemont, under 17; the old Isabella, under 33; Ives, 6; Lenoir, 45; and Winchell is about as well known as Green Mountain as by its true name. To be sure, to

be introduced under several names is as sincere flattery as a grape can have, but one does not want to pay an extra price for an old grape under a new name.

The improvement of American grapes has scarcely begun, and one may expect new varieties from year to year in numbers greatly exceeding new varieties of apples, pears, plums, or peaches, all relatively stable. In particular, it may be expected that there will be more productive kinds, seedless varieties, and far better wine grapes.

The term 'improved' or 'pedigreed' is always an unqualified misrepresentation. Fruits propagated by cuttings remain the same throughout all time. A grape cutting is literally a chip off the old block. Variations in varieties of grapes are often brought about by varying local conditions or by better care; but, if cuttings be taken from these variables and be planted in identical environment, they invariably turn out to be identical varieties. One may often see two vineyards of Concords side by side, let us say, owned by 'Smith' and 'Brown.' Smith's grapes may be so much better than Brown's that one might conclude that there are two varieties. Brown could explain the difference if asked. He would say, 'Smith pets his grapes.'

Occasionally in grapes, as with most cultivated plants, there are sports, mutations, or bud variations, as these breaks are called, which are transmitted through cuttings or grafts. These may or may not be the start of new varieties of value. Out of the several thousand varieties described in the author's *Grapes of New York*, only two or three are known to have originated as bud variations.

Nearly every nurseryman specializes in fruits. Generally speaking, it is best to buy grapes from a man who specializes in growing grapevines. New varieties are exceptions. It is usually best to buy new varieties from the originator, who, of all men, ought to have the plants true to name. Besides, the originator deserves to reap the reward for having brought the novelty into existence.

Prices of grapevines are variable, changing from year to year, according to the variety and the novelty. Sometimes they may be purchased as low as \$6 a hundred; varieties hard to propagate

may cost several times that amount; and new varieties may cost as much as a dollar each. Orders ought to be placed several months in advance; but the vines should not be shipped until just before planting time. The plants come to the buyer well wrapped in damp moss, oiled paper, and, outside all, burlap. If they cannot be planted at once they must be heeled-in until planting time.

Before ordering, one should know, without any doubt, what varieties are wanted. Nothing is more disappointing, when vines come in bearing, than to find that they are not what were expected. Plan to plant early, midseason, and late varieties. If wine is to be made, vineyards in the East and North may well contain Delaware, Catawba, Iona, Diana, and Dutchesse for white wines; and Eumelan, Ives, Norton, and Clinton for red wines. At least, two or three of the varieties named, for each of the two kinds of wine, should be planted, choice being made in accordance with soil and climate.

BOOKS ON GRAPES AND WINES

More than a hundred books have been written on grapes and wines in America; in Europe, possibly ten times as many more have been published. Every epicure on grapes and wines, especially if he is a producer of these products, should own at least a half-dozen of the latest and best of these treatises. A pleasant avocation for a grape-grower is to collect grape books—first editions if possible. No man can follow all he reads in such books, but it is profitable to look at grape-growing, wine-making, and wine-drinking through many eyes.

If a collection of books on viticulture is being made, do not stop with modern works. Go back to the books of Cato, Varro; Virgil and Columella; and the two Plinys—sources of much information on grapes and wines, chief authorities through the ages down almost to the present. These old books will furnish pleasant reading for grape-growers and wine-makers during long winter evenings, when vines in the vineyards are as dormant as the posts that hold them up.

6. Planting a Vineyard

THE difficulties of planting a vineyard are greatly exaggerated. The amateur, in particular, is impressed with his responsibilities, and sends a hurry-up call to a grape-growing neighbor to come and help him get started. If the land is properly prepared, and the plants in good condition, planting is easily, safely, and quickly done. It is the great differences between a grapevine and a tree, bush, or bramble fruit that perplexes the tyro. The plants of all other fruits grow much the same in the orchard and the garden as they grow wild, but a pruned, trained, and trellised grapevine is so different from a wild grape clambering up a tree or along a fence that it is hardly recognized.

Another type of man, having seen wild grapes bearing abundantly, concludes that the vines may be left largely to themselves and that he will still have grapes. Those who have a few vines in their garden, on buildings, or on arbors, are most likely to take little care in planting and in after management. These poorly planted and neglected vines waste their substance in riotous growth of vine, and the careless grower must be content to take such fruit as comes, regardless of the amount or the quality. The grape, of all fruits, is most responsive to good care, and this care begins with planting.

PREPARING THE LAND

A home vineyard may stand for two generations. During this long period, there is little chance to improve the soil, therefore its preparation should be of the best at the beginning. To the Europeans, where the land has been cultivated for centuries, the soil

seems immortal and is lovingly cared for year after year. We, in America, are quite too likely to leave farms and gardens when they begin to run down and move on to new sites. Travel where one may in any of the grape regions of America, one sees abandoned vineyards in both large and small plantations. Much of this waste in land and plants can be avoided by preparing the land well before planting. Plate VIII shows a vineyard 30 years old, planted and kept on well-prepared land.

In the preceding chapter, we spoke of the desirability of stony land for grapes, because the stones hold heat and the grapes grow best where there is bottom heat. It is desirable, however, that the stones in a vineyard be so small that they do not seriously impede cultivation. Stones more than a few inches in diameter should be removed. In a large vineyard, boulders may be blasted or removed on stoneboats. Often neither of these two ways can be used in a home vineyard. Tillage in a vineyard, between posts and wires of a trellis, is in straight lines and boulders make good tillage impossible. If stones cannot be removed, they must be buried. The grave for a boulder should be at least a foot deeper than one thinks necessary, for they have a most vexatious way of creeping up as time goes by, probably because the soil washes away little by little and becomes more compact.

From start to finish, the soil on which grapes are planted must have some humus. A good soil for any plant teems with bacteria. It is only in soils having organic matter that bacteria thrive; a soil devoid of humus is as dead and inert as the sands of a desert. While, as has been said, the grape grows well without as much organic matter in the land as most plants need, it must have some. It suffices for most vineyards to plow under, a year before the vines are to be set, a good green manuring crop of clover, rye, vetch, or buckwheat. In a garden vineyard it may not be possible to grow a crop to plow under, in which case the grape should follow garden crops, taking care that the land is not too rich. In any case, the land, in preparation for planting, should be plowed as deep as the plow will turn a good furrow, and then thoroughly mixed with a disk tool or a spring-tooth harrow. The last task

before laying out the vineyard rows is to smooth the ground with a light harrow.

The ground after all preparation should be an earthy sponge, holding a large amount of water in which plant food is held in solution. At the same time, it should be porous enough to permit air to enter freely. It should, when fully prepared, be deeply worked to give the roots of the vines as deep and wide a root range as any variety may need. Besides, it is in shallow soils that summer drouths take greatest toll of young plants and deplete the vitality of older plants most seriously.

There is, however, a great range in soil conditions in which grapes of one species or another produce good crops. The following example is an extreme to which few grape-growers would ever think of going in choosing a soil for a vineyard.

The most remarkable vineyard that the writer has seen, as regards soil, was one of several hundred acres in southern California. On the surface, the land was as dry as the Sahara Desert and supported only a desert flora. The owner of this large vineyard had discovered that several feet below the surface there was a water table beneath which was an abundance of water. He planted his vines in ditches about three feet deep, a depth at which the grape roots could find moisture. As the vines grew he filled in the ditches with the coarse surface soil which held heat and was porous enough to permit air to reach the roots. The vines produced grapes in great abundance and of splendid quality for wine.

Drainage having been looked after, as discussed in the chapter before this; a clover-crop turned under, or manure having been added; the soil having been properly fitted, one may rest through the winter in anticipation of spring planting. The first task in the spring is to mark the land for planting.

MARKING THE LAND

Commercial vineyards are usually marked with a sled-marker, a modification of a corn-marker. But every passer-by in grape regions can see that these markers seldom secure perfect align-

ment of rows and vines. For a small vineyard much the best way to mark rows is to use a measuring wire.

A wire for the purpose can be bought at any hardware store. One needs a steel wire an eighth of an inch in diameter, at the two ends of which there should be iron rings to slip over stakes. The wire, two or three hundred feet in length, is marked with patches of solder at the distances between rows; to make the marks more easily seen, pieces of bright cloth are fastened to them.

In using the wire, the side of the vineyard which is to serve as a base of the square is selected and the wire is stretched, leaving a rod from road or fence for a headland-less space in a garden vineyard. With the wire tightly stretched, a stake is placed at each of the distance tags to represent the first row of vines. If the planting is to be at accurate distances, a little careful measuring must now be done.

Beginning at the starting point, 60 feet are measured off in the base line and a temporary stake is set; 80 feet at a right angle with the first line are now measured off at the corner stake; then run diagonally from the 60-foot stake to the 80-foot stake. If the distance between the two stakes is 100 feet, the corner is an exact right angle. With the base lines thus started, one uses the measuring wire to place accurately rows and vines, setting stakes to mark planting points.

Of course, in a small vineyard, a man with a good eye and plenty of patience can mark planting places without either marker or wire. The distances about the vineyard are measured and stakes are set to mark the ends of the rows around the area. A line of stakes is then set across the land each way through the center which the two central rows will fill. The vines can now be set by sighting, with a second man to drive stakes as directed by the sighter. This is the method that most men employ in setting a small plot.

PLANTING DISTANCES

Distances between rows and plants vary with different varieties, climates, and soils. Vigorous varieties, such as Concord, Norton, or Clinton need more room than Delaware, Iona, Diana, or

Dutchess. The warmer the climate and the longer the growing season the greater the distances between plants. And, of course, on a rich soil, rows and plants need plenty of room. In commercial vineyards, in the North, the rows are usually 9 feet apart; the grapes in the row, 8 feet. These distances require 605 vines per acre. In a home vineyard, rows 8 feet and plants 7 feet apart suffice. In a large vineyard, the distance between rows should be great enough to permit the use of two horses in plowing, cultivating, spraying, and harvesting. In such a vineyard, 8 feet between rows is the minimum distance. The number of plants per acre is determined by multiplying the distance between rows and plants and dividing into 43,560, the number of square feet in an acre.

An American grape-grower is amazed in visiting vineyards in some parts of Europe to see how crowded the vines seem to be. The stocky growing Vinifera grapes in the Old World are often planted as close as 4 by 4 feet, trained, of course, to stakes. Such a vineyard, to American eyes, at a little distance, looks more like a tomato patch than a plantation of grapes. Planted 4 by 4 feet, a vineyard contains 2,722 vines. In a home-vineyard in California, one might grow grapes 4 by 4 feet, if he cut them back to short trunks each year and trained them to stakes. But, in a vineyard of any considerable size in California, the vines should be planted far enough apart to permit mechanical cultivation, spraying, and harvesting, whether trained to stakes or on a trellis. These considerations of vineyard management must be taken into account in the South as well as in California.

Whether the vineyard is large or small, the rows should be as long as the plot of land permits, to save frequent turning at the ends of rows. If horses or a tractor are to be used in vineyard operations, there must be a turning space of 10 or 12 feet at the ends of rows. The direction in which the rows run may be of importance. In the cool North, the vines get a little more sun if the rows run north and south; but in the South or California, where a little shade may prevent sunburn, an east and west direction may be better. The direction in which the rows run is a very minor consideration in comparison with a choice dictated by the contour

of the land. Rows should always follow the contour of the land, if that be possible, to prevent the washing away of the soil, erosion being a calamity to be feared in any region having a heavy rainfall. Of course, in vineyards which must be irrigated, the run of water in irrigation ditches must be provided for.

PLANTING

Young grape plants stand a good deal of abuse, but this is no reason for careless handling. If the vines cannot be planted the day they come from the nurseryman, they should be heeled-in. To heel-in, a trench is dug a foot or so deep, in which the vines are set, singly or in bunches, after which the roots are covered with moist earth, sifting the soil in the roots, covering half the tops. The trench is filled full and the soil firmed. The plants take so kindly to this treatment that they may be kept heeled-in in good condition for a month if need be.

The day for planting having arrived, the vines must be prepared for their second birth. Pruning to establish proper reciprocity between top and roots is the main item of preparation, and the amount of cutting that must be done appalls the novice. Cut off all the branches down to a single cane and then cut this slender trunk to two, never more than three buds; then cut all the roots back five or six inches. Why all the fuss about buying plants with big tops and ample root-spread? Only that large tops indicate vigorous plants.

The pruned vines look as if they had been badly mutilated, but they have not been injured. The healthy stubs quickly form new roots and growth is all the more rapid. Most of the small roots pruned away would die, and laying them out in the planting hole is a useless procedure. The vines are now ready for planting and this task should proceed apace.

Planting is an operation quickly and easily done. One may read or be told to lay the roots out to preserve the rootlets, to water each plant as it is set, to make sure that it stands in the vineyard as it stood in the nursery, to puddle the roots in a pail of thin mud. All this is nonsense if the plants are in good condition.

The roots may be puddled if the soil and plants are very dry. There is no need of other putting over-niceties in planting the grape.

Some forty or fifty years ago a man named Stringfellow wrote and spoke voluminously about a new way of planting trees and vines. He taught that all that was needed was to make a hole in the ground with a crowbar, and cut off all the roots and most of the top. Thousands followed Stringfellow's advice, and failure was usually the result. Such slap-dash methods will certainly not do in planting a vineyard. Burying the roots too deep in the earth or planting them too close to the surface is courting failure.

The wisdom of thoroughly preparing the land is evident when the work of digging the holes is at hand; for, in well-prepared land, this simple task is done in a minute; one or two thrusts with a spade suffices. The hole need be only large enough and deep enough to hold the roots a little deeper down, when the earth is well firmed, than the plants stood in the nursery.

The holes should not be dry when the plants are set. The plants start best in freshly turned, moist soil of newly turned earth, which can be firmly compacted about the roots. It is poor practice to put manure or commercial fertilizer in the soil or about the plant—the young vines cannot make use of it. In digging, put the moist surface soil on one side and subsoil on the other, and cover the roots with a spadeful of the top soil.

The best time to plant in the North is early spring. At this time showers and sunshine have unlocked the nutritive solutions and in the long daylight hours these pass more quickly to their appointed places than in the autumn. Fresh roots and dormant leaves of the mutilated plants quickly go into action. In the far North, in particular, one takes the risk of winter-killing and of having the vines heaved out of place if he plants in the fall. If it seems desirable to plant in the autumn to save time, the action of freezing on plants and soil can largely be overcome by mounding up the earth to the very tip of the vines, leveling the mounds in early spring.

Time is saved if two men take a hand in planting. While one

man digs the hole, another prunes the vine and roots; while man number two holds the vine in place and tramps the earth about the roots, number one, the shoveler, fills the hole. It is the business of number two to align the plants from two sides and to replace the stakes, usually a sharpened lath, in its old place to serve as a support for the growing vines. The top soil about the newly set plant should not be firmed; or, if so, should be loosened with a rake or cultivator to form a dust mulch, the only mulch needed.

Watering when planting is necessary only when the land is very dry. If used at all, water should be put on liberally, a gallon at least to a vine. It is best put on when the hole is nearly filled and the soil has been firmed. When the water has soaked down, the hole is filled but not further firmed. It is often more convenient, and probably is as good as watering for the plant, to have a pail of water into which soil has been put to make a thin mud in which the roots are puddled; the plants should stand in the mixture for some minutes before planting.

When all has gone well, with amazing energy the seemingly dead plant starts growth and the vine is on its way. Soon the green shoots are two or three feet in length and flop hither and yon with the wind if not tied to the stake left for their support. Any departure of well-being is quickly told by the color of the leaves in old or young vines—as accurate a gauge as is the pulse in humans. A change of color from the luxuriant green of normal grape foliage to a yellow hue is a sure sign that the leaf-green or chlorophyll, essential to growth in any plant living in the soil, is not functioning. These yellow-hued plants have the indefinable air of malaise of any living thing out of normal health. Such plants are in need of nursing, the reason for which should be discovered as soon as possible.

THE 'TENDER NONAGE'

Virgil, whose word was law for eighteen centuries and from whom grape-growers in these days may still learn much, talks much about the 'tender nonage of the vine,' the time from plant-

ing to the first vintage, and tells us that at this time the vines need careful rearing. Indeed, grapes do need tender rearing in their nonage, especially in their first year, at which time a vine probably does the briskest bit of living in its whole life.

This first year the grape-grower's hope is for an early spring, abundant rainfall, sunshine and warmth through the summer, and a late fall. How seldom is the hope realized! Almost never is there a perfect summer. Drought, heavy rain, wind, hail, insects, and fungi all combine to impede the growth of yearling grapes, and to prevent the first year's growth from maturing sufficiently well to withstand the cold of the first winter. Insects and fungi can and must be controlled; something in the way of cultivating can be done to offset dry weather; but the vines are almost wholly at the mercy of winds, hail, and freezing weather.

Scarcely a summer passes in America but that in one month or another the earth is baked and parched by drouth. In these dry times there is little or no growth; the leaves are limp, thereby telling their tale of thirst; the bunches are small and the berries are nubbins. Not much, yet something, can be done. If the soil has been deeply plowed and if a cover-crop has been turned under, the earth will hold moisture to carry the plants over. Cultivation may help. In a small vineyard the vines may be watered.

THE FLOW OF SAP

The old books on grape-growing had much to say about the flow of sap. This, that, or the other operation 'checks the flow of the sap.' It was thought that the sap went up in the spring, down in the autumn. There is no flow of sap peculiar to spring and fall that any operation by man checks. A century ago much of the talk about the flow of sap was unintelligible, much absurd, and practically all was unimportant.

About all that matters to cultivators of plants is, roughly, that throughout the growing season, the function of sap is to carry nutrients from the earth through the roots and the trunks and the canes to the leaves, where the alchemic effects of light and heat and warmth from the sun change inorganic matter in the

leaves, in the presence of leaf-green or chlorophyll, into organic matter, which is then sent to every part of root, stem, and fruit as nourishment.

In no other orchard plant are the highways and byways of sap circulation so easily discoverable as in the grape. In the practical application of such knowledge, perhaps the grape-grower need be concerned with only one phase, the so-called 'bleeding' of grape-vines, which to some is of deep concern but to experienced growers is of small matter.

It is wrong to compare the 'bleeding' vines with the bleeding of animals. There is a constant stream of sap in early spring from the grapevine when cane or trunk is cut in pruning or grafting. Little harm is done by this loss of sap, which cannot be avoided in grafting in the field or in late pruning. One prefers to have as little as possible of it, because the sap outside the plant sours and makes a messy trunk or cane to work with and, perhaps, may make a lodging place for fungi; it is doubtful, however, if the fungi that grow in sour sap is harmful.

RIPENING THE WOOD

The old pomologists who had so much to say about 'checking the flow of sap' very often discussed another plant phenomenon under the heading 'ripening the wood.' This is a matter of much more importance. What is it? Why of value? How attained?

Ripening the wood includes two quite distinct processes: hardening of structure and storage of nutritive materials. All new growths in the grape, as in other hard-wooded plants, are hardened, that is, the wood is ripened, by the deposit of woody material in the cells. One knows that this process is going on when the green shoots of the vine begin to turn reddish or brownish in late summer and autumn. This ripening of wood is very essential to the grape in cold climates, for, if it does not take place properly, winter-killing is almost sure to follow. There is not much that can be done in an old vineyard to help vines to ripen their wood, but in the season of planting, which is being discussed in this chapter, a good deal can be done. First, no manures

or fertilizers should be used. Second, the vineyard should be cropped with vegetables, or a cover-crop should be sown in early summer. By these means, late growth in young vines may be checked.

In the ripening of wood, nutritive substances are stored in all parts of the dormant plant. These are chiefly sugars and starches to be used when the buds are stimulated by heat into growth. If insufficient material is stored, the plants get a poor start for the summer that follows. The storage of food, and for that matter the ripening of wood, goes on during the summer as cells mature, but is greatest in the autumn when growth is checked and the plant uses less food. In normal, healthy growth, these processes go on uninterruptedly until the plant goes into its winter rest. When the season is short, or when there is much late rain, a second growth may come on to be nipped by winter freezes.

The American Indian summer is sometimes a godsend to grape-growers in the far North, especially when it follows a luxuriant summer growth. Warm sunshine in the day, cool nights, and moderate drouths bring on the 'sere and yellow leaf' of autumn and ripen the wood of all desiduous plants, so that they go into winter with firm wood and plump buds well stored with nutritive materials.

WHEN DOES PRUNING BEGIN?

The vines need no pruning the first summer, the young plants having been taken care of in this respect at planting. As growth starts, several shoots spring forth as if by magic; these should be left to help feed the vine and to encourage the formation of an ample supply of roots. In the case of grafted vines, suckers coming from the stock should be removed. As has been said, the strongest shoot should be tied to a stake, keeping the young vine on the windward side to prevent the tie from snapping.

In the winter of the first year, the vines are again pruned. This is an operation that wrings the heart of the novice. Nearly all the splendid growth of the first summer must be cut away. Only one cane, the strongest of course, is left, and it is cut back to two buds,

not much more than was put in the ground several months before, at least the eye would say so. There is more, however. The trunk is much sturdier, and an examination of the roots would show that there are many more with ramifications far and wide, and masses of rootlets. Such roots will produce a sturdy trunk the next year.

This first pruning in the vineyard should be done in autumn in cold climates as soon after the leaves fall as possible. Fall pruning is followed by mounding the earth about the young plants with spade or plow for winter protection. The plants are now ready for the worst of winters in any climate where grapes grow.

7. Care of a Vineyard

THE expressive word 'fruitfulness' is exemplified in no other fruit so well as in the grape. When all is favorable in grape-growing, the crops are so large that it would seem that soil, sun, and rain conspire with man to load grapevines with fruit. Nature works with man, however, only when man does his part. A vineyard in particular, among all plantations of fruits, is the product of the man who plants and tends it. Because of the special care one's vineyard requires, the owner, in the end, becomes more attached to it than to any other plantation of esculents he may grow.

Most owners of home vineyards have taken up grape-growing as an avocation and, as amateurs, must learn the secrets of management of vines. Every operation in a vineyard, from planting to harvesting, is very different from work in the culture of any other fruit; so, to keep a vineyard fruitful, new knowledge is required even by those who have been successful in growing other fruits. It is only by giving the best possible care that a man gets lasting pleasure out of growing vines.

In the chapter on planting, the care of the vines through its first year was described; now we begin with the care of the vineyard in the second and succeeding years. At the beginning of the second year, it must be decided whether the young vines are to be given clean cultivation or are to be grown with catch-crops or cover-crops.

CATCH-CROPS AND COVER-CROPS

A *catch-crop* is a vegetable grown in a vineyard for profit or for kitchen use. A *cover-crop* is some field plant grown between rows

of grapes to protect the soil or to furnish green manure. Cover-crops, as green manures, their most valuable purpose, are harvest from the earth, returned to the earth to grow afresh and be harvested again in greater abundance as grapes.

Intercropping a vineyard with catch-crops is seldom worth while for more than two or three years. Any of the vegetables, including such lusty feeders as cabbage, tomatoes, beans, and potatoes, may be grown between the rows in a vineyard if the land is fertile. With these vegetables, fertilizers should be used, and tillage should be of the best. Strawberries, while not particularly desirable, may be planted the first year to stand two years; bramble and bush fruits never. Corn and grains should never be used for intercropping the grape. Sometimes grapes are planted as fillers and thus become catch-crops. When this is done, twice as many vines are set in a row, with the expectation of cutting out alternate plants after a few years. The small crops thus grown are seldom worth the cost of plants and care.

In the Old World, grapes are often planted in orchards as fillers, especially in orchards of the dwarf, slow-growing olive. Where the amount of land is limited in American home orchards, grapes might be used as fillers, but this is not an expedient to be recommended. Any catch-crop is an expedient to be resorted to, for most part, only when the owner of the vineyard is hard pressed for land.

Cover-crops, valuable for all tree fruits, are not of great worth for the grape. A number of experiment stations have tried various cover-crops for grapes, some of them running as long as ten years, with little to show in the way of increased yields. When cover-crop seed is expensive, it is very doubtful if they pay. There is another objection to a cover-crop, seemingly insignificant, which yet is pertinent in a vineyard, large or small. In harvest time, a crop of any kind, weeds or sown grains, is soaked with rain or dew, and pickers will not work until the sun dries the inter-crops.

Whether or not the protective effects or the green manure turned under are sufficiently worth while to pay for the cost of

the cover-crop in the average vineyard, it is probable that in gravelly or stony lands, in the long run, a cover-crop is worth planting to supply humus, especially so as in such soils the vineyard can then be kept in better tilth. Probably, also, in most seasons cover-crops help to mature the wood. A cover-crop that makes a vigorous growth in late summer and remains on the land all winter is a great help in keeping land from gullying.

The legumes when used as cover-crops take nitrogen from the air and leave it in the soil. Three legumes, the soybean, clover, and vetch, may be sown in a vineyard, and of these, at present prices of seed, the soybean is best. It should be sown at the rate of 6 pecks to the acre. Oats, sown at the rate of 2 bushels to the acre, make a cheap and fairly good cover-crop, as does buckwheat, sown at the rate of a bushel to the acre. Some grape-growers sow alternate alleys between rows in alternate years, which leaves an open alley each year for picking. Whatever the crop, it should be sown in late July and plowed under the last thing in autumn or the first thing in spring.

Nature sometimes provides a fairly good crop of weeds which serve as a cover-crop and at no cost. If wanted for this purpose, let the weeds grow after the last cultivation in July.

TILLAGE

It is important to have a strong vigorous growth of grapevines the first few years after planting. Vines neglected in these first years will never catch up with those which were well cared for, or, perhaps, coddled. Of all the things a grape-grower can do to coddle his vines, tillage is cheapest and best. Tree fruits can be grown in sod, with the grass cut as a mulch in mid-summer, and grow fairly well. The grape will not grow in sod. Skip one or two years of cultivation in the early life of a vineyard, and one may as well, or better, pull the vines up and start over. There is no tonic for grapes that quite equals cultivation. There is no way of keeping vines alive and growing in a dry summer that quite equals cultivation. Tillage is difficult in hilly land upon which grapes are so often grown, but it is indispensable.

For a vineyard of any size—say an acre even—several tools for cultivating are required. A two-horse plow and a one-horse plow ought to be available. Sometimes a spring-tooth—or a disk-harrow are needed—one or the other at the very least. A cultivator and a weeder are good tools to have on hand. A one-horse grape-hoe saves labor, though a heavy hand-hoe may be all that is needed in a small vineyard. A clod-crusher, a roller, or a float to pulverize the surface soil, or some such tool is helpful. Few owners of small vineyards need possess all these tools, since in most localities a farmer having them can be hired to use them.

Tillage begins with plowing in early spring. First, a furrow is made with a one-horse plow throwing the soil up to the vines, to be followed with a two-horse plow between rows, though, of course, in a small vineyard, all the plowing can be done with one horse. Tillage with a harrow, cultivator, or weeder then follows at intervals of two weeks until late midsummer, when a cover-crop is sown or the vineyard is turned over to weeds, as the grower may choose.

About the time grapes blossom, the furrow turned up to the vines at the first plowing is leveled off with a one-horse grape-hoe or a heavy hand-hoe. At this time, or a little later, weeds are hoed out of the row, and suckers are removed. Four inches is quite deep enough to plow. In an occasional vineyard the disk or a spring-tooth-harrow may be used in place of the plow and be continued as a cultivator through the summer.

Plowing and cultivating, or their equivalent in hand work, may be made a means of combating some insects and fungi. The pupae of the root-worm, a grave pest in some vineyards, are thrown out and destroyed by the grape-hoe just as they are emerging as adults to lay eggs. Mummied grapes covered with spores of black-rot or the mildews are buried by the plow and do not perpetuate their kind. Turning over the soil is true vineyard sanitation and as such is not the least of the good results following cultivation.

There are several reliable guides to decide the proper time to cultivate a vineyard. When weeds begin to take food and water

From the vines, as they will long before midsummer, the cultivator should be started. Even earlier, after spring plowing, when the land is rough and covered with coarse clods, the condition calls for cultivation, which will increase the water-holding capacity of the soil. And when, after a rain, the surface soil is baked and hard, tillage is indicated.

It is a good rule to stop cultivating a few weeks before the grapes reach full size; for by this time, they will have loaded the vines down so that fruit and foliage will be injured by the cultivator. In New York or Michigan, this would be about the last of July—earlier the farther south. Vigorous varieties, as Concord or Clinton, do not need to be cultivated as late as Delaware or Iona, weak-growing varieties. Sow the cover-crop at the time of the last cultivation.

In vineyards in the North where winter-killing may occur, some special work in tillage is necessary. Late in autumn the soil should be thrown up to the trunks of the vines. This banking up must be finished with spade or shovel to make sure that the vines are well protected. If the soil is thrown up to the vines in the fall, the spring plowing is away from the vines rather than toward them, as is usually done where there is little danger of winter-killing.

In concluding this discussion of tillage, it must be said that the operation varies with every part of the country. Tools differ greatly; the number of times vines are cultivated is not the same; some prefer spring banking up, others late fall; and the depths to plow and till vary. Those who have home vineyards should follow the practices of commercial growers in their neighborhood.

FERTILIZERS FOR GRAPES

Of all cultivated fruits, grapes are best able to find nourishment in soils where there is little plant food. Soils too fertile are as little desirable as those in which there is not enough plant food. In soils too rich, the season's wood does not ripen; the crop does not set well; and the grapes lack sugar and flavor, though the

bunches and berries may be large. Very often fertilizers are wasted in vineyards. This is especially true in the garden soils in which home vineyards are usually planted.

When vines are vigorous, making a fair annual growth and producing fair to good crops, it may be assumed that fertilizers are not needed. When a vineyard is failing in these respects; or when the leaves are few, small, and have a yellow cast instead of being bright green, one may know that something is wrong. The first step to take when grapevines are not growing well is to look after the drainage; the second is to till assiduously for a season or two. In addition, insect and fungous diseases must be fully controlled. Drainage, tillage, and pest control, having been tried without complete restoration of health in the vines, application of fertilizer, in a home vineyard at least, is the last step to take.

Yet, in common with all other agricultural crops, grapes require some attention to food requirements. The grape takes oxygen and carbon dioxide from the air through the leaves. All other foods are minerals dissolved by water in the soil to be taken in by the vines through the roots. Of the several minerals needed by plants—nitrogen, phosphorus, potassium, calcium, iron, sulphur, and magnesium—only the first three need to be supplied to soils.

One general conclusion may be made. In very few soils are all three of the main constituents of fertility—nitrogen, phosphorus, and potassium—needed, and scarcely any two types of soil need the same fertilizers in the same amounts. Nitrogen, experiments and experience show, is the constituent of a complete fertilizer most frequently lacking, though it is possible that some soils are so shallow, or that the range of the roots is so limited by texture, wetness, or dryness, that a complete fertilizer is needed; generally such soils are not fitted for grape-growing.

In a vineyard of any size—even an acre or less—the soil may be so uneven that only parts of it may need fertilizers. Here, the small grower has an advantage. He can use fertilizers on some vines but not all. The vine may often be the unit in fertilizing, rather than the vineyard.

Which of the three chief elements is needed can be determined by the simple expedient of trying each one and combinations of the three on small plots of vines. It will then be seen which the grapes respond to, if any. It is doubtful whether an analysis of the soil would tell much except whether the soil is acid or alkaline, and this is so unimportant for the grape that it is hardly worth knowing; generally speaking, grapes do best on soils a little on the acid side. In most experiments reported, the addition of lime to vineyards produces no change for better or worse in plants or in fruit.

A SIMPLE FERTILIZER EXPERIMENT

Lay out as many plots in a vineyard as are wanted to try fertilizers. On plot 1 use well-rotted manure; on 2, a complete fertilizer; on 3, phosphorus; on 4, potassium. On most soils the fertilizers should be used in these quantities per acre: manure, 5 tons; nitrate of soda, 200-300 pounds, or ammonium sulphate, 150-200 pounds; muriate of potash, 100-200 pounds; phosphate or super-phosphate, 200-250 pounds. The experiment should run at least three years and five or six would be better.

The oldest and longest experiment of this kind was tried in some half-dozen vineyards at Fredonia, New York, for twenty-five years, carried on by F. E. Gladwin and under the direction of the writer. The results brought forth these recommendations: *

As a result of 25 years of vineyard experimentation with many soil types of fertilizers, it is very evident that the grape responds very markedly to moderate applications of quickly available nitrogen, such as nitrate of soda. Amounts of 250 pounds per acre broadcasted in the spring before plowing have paid for themselves in larger yields of higher quality fruit. These applications are more effective in fruit production than in cane and leaf increase, although the effect on the latter is readily measurable. Nitrate of soda appears to increase the compactness of the cluster through influencing more berries to set. Tests have shown that 200 to 300 pounds of superphosphate annually have improved the growth of

* For a full account of these experiments, see Bulletin 381. N. Y. Agr. Exp. Sta., Geneva, N. Y.

the various green manure crops, and muriate of potash, 200 pounds to the acre, are desirable.

Stable manure, the stand-by of all tillers of the soil, in these Fredonia experiments did not pay for itself. It was used at the rate of 5 tons per acre in 60 different plots for from 10 to 25 years. Stable manure varies considerably in the amount of its food ingredients, a fact which complicates any deductions one may draw. Much depends also on how coarse or how well rotted it may be, since a coarse manure, theoretically, at least, ought to improve the texture of a heavy soil. Also, manures usually furnish bacteria whose activities in the soil are beneficial. Yet, in these experiments, at a rather high cost it is true, they did not pay. After all, it is a waste of words to discuss the use of stable manure in these days of automobiles. Manure of any kind is a luxury that few grape-growers can afford as an annual fertilizer.

It makes little difference whether vines are fertilized in late autumn or early spring. It seems rather more natural to put fertilizers on in the spring, when growth, in all its aspects, is at its highest. A good time to apply chemicals is just before the first cultivation. Natural manures are usually plowed under, though presumably cultivating them under would do as well. Grape roots forage far and wide, and whatever the fertilizer it must cover the whole surface of the vineyard. Either drill or sow chemical fertilizers broadcast; if the foliage is out, drilling is better, since in broadcasting the chemicals may burn the tender foliage.

Without any question some soils are too fertile for the grape. One often sees vines and sometimes vineyards on black, rich soils on which farm and garden crops grow to perfection, but the grape is not at its best. Usually on such soils the grapes are poor in quality; the over-luxuriant vines are hard to discipline in training and pruning; fruit buds do not set in sufficient numbers; and the wood does not mature in autumn. To be sure, some varieties grow better in rich soils than others—a matter to be discovered by experiment. Then, too, the over-richness may cure itself as the vineyard comes in full bearing. When vines run to

luxuriant growth and the fruit buds are few and the fruits are poor in quality, if over-richness be suspected, it is helpful to put up a third wire, to prune less, and to put up more buds.

WINTER PROTECTION

It is surprising how well grapes may be grown in the far North if the vines are given winter protection. It is not too much to say that with covering of one kind or another, grapes can be grown as far north as the apple or the sour cherry. Covering with earth, the best of the several ways of protecting grapevines from freezing, is not costly nor is the work difficult.

In climates where winter protection is necessary, there should be several preliminary operations, all of which have been discussed before. Perhaps it is well to summarize these briefly: Cultivation is stopped early; a cover-crop is sown to help mature the wood early; nitrogenous fertilizers are used sparingly; it is better if the vines are planted on rather poor gravelly or stony soil; and pruning should be rather light so as not to induce long, soft growths.

Covering with earth is far cheaper and better than wrapping with straw, hay, or other material. To cover with earth, the vines must be laid on the ground. In this laying down, the vines must be trained for bending. A way of training must be chosen in which renewals may be made frequently from the ground so that if the trunks become unpliant, a new trunk can be trained which can be readily bent.

Laying down in autumn is preceded by pruning, after which the arms and trunk are loosened from the wires and bent to the ground. Bending is made easier by removing a spade full of earth from the side of the vine in the direction in which the vine is to lie. The trunk is then laid on the ground and covered with sufficient soil to keep it in place and to cover the whole plant lightly.

The vines are laid down any time between the fall of leaves and heavy freezing. It is all important to take the vines up early in the spring; for, if the covering is left on too long, foliage and vine are tender to sunshine and frost; on the other hand, of course, if the vines are uncovered too early, frost may do harm, but this

is doubtful if the earth is thawed. Grape-growers in New York say that vines may be laid down at a cost of from \$6 to \$10 per acre. If, in the operation, a trunk is broken, the vine is easily renewed by grafting.

WINTER INJURY

No matter what is done in the way of winter protection in any of the states east of the Rocky Mountains and north of the Ohio River, there are now and then winters in which some grapes suffer from freezing. Seldom a year passes in which some varieties are not hurt in wood or fruit by cold weather. Winter injury is probably the chief source of injury in the vineyards of the East and North.

The grapevine must be as nearly as possible perfectly dormant if it is to withstand a very cold winter. In the far South where there are no frosts the vine becomes almost an evergreen—flowers opening, fruit ripening, shoots putting forth all at the same time. Growth never ceases. The grape in these tropical and sub-tropical climates is not at home. The fruits are small and nearly worthless; the foliage is over-luxuriant; and even though fungi, which thrive under excessive heat and moisture, do not kill the plants, the grapevine comes to an early death. To grow and produce good grapes a dormant period is necessary for all cultivated grapes.

Grapes grown under glass as well as those in the vineyard must have a dormant period. To grow the magnificent bunches of grapes that come from hot-houses, the vines must have a period of rest comparable to the out-of-door period. Some of the most successful growers of hot-house grapes plant the vines in the border outside the hot-house, in which there are openings through which the vines pass from the roots out of doors to the warmth under glass. This outside planting ensures a complete rest through the winter.

The dormant period begins with the dropping of leaves. This, of course, means that in a dormant vine little water passes from the plant, one of the functions of leaves being to give off water.

The ripening canes become more and more woody, which further prevents the loss of water as also does the thickening layer of cork in the bark. A hardy vine is a vine that is well supplied with water during the cold of winter.

To be sure, the water in dormant vines freezes, but the harder the dormant cells are, the less they are injured by freezing. In cold weather much of the water in the tissues of a plant is in the intercellular spaces and ice protects that which is within the cells of the tissues. As the dormant period progresses and cold strengthens, the sap is more and more condensed in the cells—contains more and more solids—a condition which favors resistance to freezing. With the first burst of warm weather in the spring the cells absorb moisture from the intercellular spaces and the ascending sap from the earth. The vines now begin to assume their summertime condition and buds get ready to burst into leaf and flower.

Three important conclusions may be drawn from the role of water in dormant plants. The most important of the three is, as has been so often emphasized in these pages, that everything possible should be done to enable the vine to ripen its wood quickly and thoroughly. Second, that, in addition to cultivating, fertilizing, pruning, and sowing cover-crops, the grape-grower must supply the vineyard with water in late summer and autumn (though immaturity may be favored by too much water in late summer). Third, it may be expected that winter injury is most frequent and most severe when the cold is long continued, a fact well supported the country over by accounts of winter injury.

HARDINESS IN GRAPES

Grape-growers everywhere in eastern America have found that species and varieties behave quite differently in resisting cold in vines of the same age, in the same vineyard, under the same care. Resistance to cold is a characteristic of species and varieties, no doubt correlated with hardness of wood. Of the commonly cultivated species *Vitis vulpina* is hardest; *V. Labrusca*, *V. aestivalis*, and *V. rupestris* are about equally hardy; *V. vinifera* is a little

less hardy than the three species just named and *V. rotundifolia* is least hardy. Hybrids vary between the species in hardiness.

At the New York Experiment Station, Geneva, New York, the grapes described in Chapter 14 may be put in six groups in regard to hardiness in both wood and bud, though the buds of some varieties, because of early blooming, may not be correlated with hardiness in wood. In the table that follows the hardiest grapes are put in Group I, the least hardy in Group VI.

TABLE III. TABLE GROUPING GRAPES IN HARDINESS OF VARIETIES

GROUP I	GROUP II	GROUP III	GROUP IV	GROUP V	GROUP VI
Beta	Bacchus	Athens	Brilliant	Beacon	Eden (Rot.)
Hungarian	Berckmans	Brocton	Catawba	Fern Munson	Flowers
Janesville	Clevener	Bronx Seedless	Buffalo		Herbemont
	Clinton	Concord	Cynthiana		Hopkins
	Elvira	Delaware	Diana		James
	Eumelan	Diamond	Dutchess		Lenoir
	Montefiore	Dunkirk	Golden Muscat		Mish
	Noah	Eden (Lab. x Vin.)	Headlight		Scuppernong
		Fredonia	Iona		
		Hanover	Keuka		
		Hector	Niagara		
		Hybrid Franc	Norton		
		Isabella	Rommel		
		Jewel	Stout Seedless		
		Kendaia	Triumph		
		Ontario	Urbana		
		Portland			
		Ruby			
		(Seibel hybrids)			
		Seneca			
		Sheridan			
		Van Buren			
		Watkins			
		Westfield			
		Yates			

8. Insects and Fungi

THE grape has as many pests as any other cultivated crop. Some come as real pestilences and others cause only slight ailments. No variety of this fruit is wholly free from injuries by insects and fungi, and none can be grown with high degree of success without treatments of one kind or another; everyone who grows grapes must have an annual routine for the control of insects and fungi. Happily there are remedies to prevent or cure all the diseases, insectivorous or fungous, found in vineyards, provided they are applied properly.

INSECT PESTS OF THE GRAPE

Entomologists have described some 200 insects that feed on wild grapes in North America. Probably all of these are found in vineyards in one place or another, but fortunately only a few are widely distributed, abundant, and destructive. Of all insect pests, phylloxera is the most widespread and most dreaded, since it is to be found in nearly every vineyard in the land. However, it is not so terribly destructive in eastern America as it is in California or Europe.

PHYLLOXERA

Phylloxera vastatrix is a plant louse that feeds on the roots of the grape. It is a native of North America east of the Rocky Mountains, whence it was introduced into France and California, in both of which regions it is most destructive. It is a pest of vines growing on heavy soils; on sandy soils many varieties are nearly immune. Decay follows root injury by phylloxera, which

sooner or later destroys the roots of infested vines. The European grape suffers most; native species suffer a little.

The life history of the insect is very complex and need not be given in detail. East of the Rocky Mountains, the presence of the pest is made known by leaf-galls on the underside of the leaves, as shown in Figure 10. These galls are seldom seen in California or on the leaves of some varieties in the East. There is no sure cure for this louse on badly infested plants. European



Fig. 10. Leaf-galls of the phylloxera.



Fig. 11. Injury caused by grape root-worm beetles.

vineyardists once treated their vines with carbon bisulphite at the rate of 150 pounds per acre, an expensive and not wholly successful method; others flooded their vineyards; still others planted on sandy soils. All these methods have given way to grafting on resistant stocks, as described in Chapter 3.

THE GRAPE ROOT-WORM

The larvae of a dark-brown beetle is a destructive pest in the grape regions of New York, especially along the shores of Lake Erie. The worms feed at first on the rootlets and later on the bark of large roots. So obvious is the work of the root-worm that one is never at loss to know the cause of injury to vines infested by this pest. The worms feed during late summer, and the next June transform into pupae, from which they emerge a little later as adult beetles.

The presence of the adult beetles is easily detected, for they feed ravenously on the upper sides of the leaves, leaving chain-like markings, shown in Figure 11. A fortnight after the beetles begin feeding on the foliage the females begin laying eggs under the rough bark of the vine. These hatch in July or August, and the young grubs at once begin feeding on the roots.

One may destroy either the adult beetles before they lay their eggs, or the pupae in the ground. The beetles are best killed by spraying the foliage with a mixture of molasses and arsenate of lead, or a spray of bordeaux mixture and arsenate of lead may be used as shown in Grape Spray Schedule, Table v, page 106. A good way to exterminate the pupae is to leave a ridge of earth under the vines at the last cultivation, and when the larvae are through pupating level the ridge with the cultivator or hoe; or both treatments may be used in bad infestations.

With this or any other vineyard pest, it is a good plan to consult your experiment station, for pests and treatments vary considerably in different localities, and only someone near at hand can advise the best treatments.

THE GRAPEVINE FLEA-BEETLE

When the buds of grapes are swelling in May and June, a shiny steel-blue beetle is often found feeding on the tender young buds. The insect is called steely-beetle or flea-beetle. The insect is not hard to get rid of. In a small vineyard an easy and very satisfactory way is to jar or knock the beetles into a pan containing a shallow layer of kerosene. In large vineyards, or if one is a pacifist and gets no satisfaction in killing with one's own hands, spray with 3 pounds of arsenate of lead in 50 gallons of water. Here is another case in which vineyard sanitation is very helpful, since the beetles hibernate under leaves, in rubbish, and on the rough bark of the vines to emerge in the warm days of spring to seek the tender buds of the grape. The coming of this pest is foretold by eggs laid on the canes, as shown in Figure 12.

THE ROSE-CHAFER

About the most annoying insect pest that feeds in gardens, orchards, and vineyards is a yellow-brownish beetle about a third of an inch long, which attacks many plants toward the middle of June. The rose is a favorite food, hence the name *rose-chafer*. Grapes or other plants growing on sandy soils suffer most from this insect. The chief damage to the grape is done to the blossom.



Fig. 12. Eggs of grapevine flea-beetle.



Fig. 13. The mature stage of the grape leaf-hopper.

The larvae feed on the roots of grasses, having a particular liking for the roots of foxtail, timothy, and blue-grass.

It is not easy to get the best of this pest. Unfortunately one never knows whether an infestation is to be light or heavy and often hopes against hope that he can get by without a combat. In regions where the beetles are usually pestiferous, one should always prepare for the worst. There are three methods of control —none satisfactory. One may try to destroy the larvae; kill the pupae; or kill the beetles.

Since the larvae feed on the roots of grasses, it is very easy to locate their breeding places and plant the ground to cultivated crops, destroying both the grasses and larvae. The second method, that of killing the pupae, is to cultivate the vineyard during the pupating period with the hope that the pupae will be crushed. The third method, by far the most effective, is to spray the vines

with a sweetened arsenical spray. Keep watch for the appearance of the very first beetles during blossoming time, and spray at once with a mixture of 6 pounds of arsenate of lead, 1 gallon of molasses, and 100 gallons of water. If a rain comes on at once, spray a second time.

THE LEAF-HOPPER

The grape leaf-hopper is another destructive pest on some varieties. The mature stage of this pest is shown in Figure 13. These leaf-hoppers pierce the underside of the leaf, suck the sap, and insert their eggs in the leaf. When an almost infinite number of the insects go through this process on a single vine, the vigor of the plant is lowered and the quality of the fruit suffers. The leaf-hopper has several host plants, of which strawberries, raspberries, and blackberries are most likely to be near vineyards.

The method of defense that at once suggests itself is to keep the vineyard as far away from the other hosts as possible, especially from raspberries. The most effective method of control is to spray the vines with some contact spray, the touch of which will kill the insect. Black Leaf 40 has long been a standard spray, applied before the young hoppers develop wings. Use a half pint of this nicotine preparation to 100 gallons of water. The spray must touch the insect and therefore must be applied to the underside of the leaf. The destruction of hibernating places is a good means of keeping leaf-hoppers under control. All rubbish in the vineyard and all weeds and grasses near the vineyard should be destroyed in late autumn.

THE GRAPE-BERRY MOTH

Another of the insects that despoil the grape is especially pestiferous, since it feeds on all varieties of this fruit, is found in vineyards in every part of North America, and is difficult to control. This is the grape-berry moth, the larvae of which is a dark-colored caterpillar. There are two broods of these caterpillars, the first of which feeds on the stems and external parts of the grapes; the second brood attacks the berries, despoiling so many

that the clusters are ruined. Figure 14 shows the work of these caterpillars.

The grape-berry moth is difficult to control, but its ravages can be curtailed somewhat by spraying and vineyard sanitation. At present the spray in use is bordeaux mixture, to each 50 gallons of which are added 3 pounds of arsenate of lead paste, spraying to be done just after the fruits set. Some growers add to this spray



Fig. 14. Grapes despoiled by the grape-berry moth.



Fig. 15. The work of black-rot.

$1\frac{1}{2}$ pounds resin-fish-oil soap. In small vineyards it is good practice to pick and destroy the berries infested by the spring brood. Plowing in late fall or early spring to bury the larvae rather deeply so the moths cannot work their way out is also done.

INSECTS OF MINOR IMPORTANCE

To name many more of the 200 insects that feed on the grape would discourage all but the strong-hearted. Happily, most of the remaining worms, aphids, moths, and other representatives of the insect world appear only in occasional years, or in a few grape regions, and do not often cause great damage. Of these the most likely ones to be met are several species of cutworms, which climb

the vines and eat expanding grape leaves. Poisoned bait placed at the base of the vine will destroy most of them. The grape curculio, similar to the 'little Turk' (so named because of the crescent wound on the fruit), which all know on the plum, is often a pest, easily destroyed by spraying with an arsenical poison. The grape-vine-root-borer is sometimes troublesome and is difficult to deal with. Thorough cultivation in June and July will destroy most of these borers.

FUNGOUS DISEASES OF THE GRAPE

Four fungous diseases of the grape are so prevalent and destructive in eastern vineyards that the grape-grower must be on the lookout for them, and as many more occasionally despoil fruit or foliage. There are regions, as the several grape-growing areas in western New York, so fortunate in their freedom from fungous diseases of the vine that there is little uncertainty in grape-growing and but small expense in keeping fungi from doing much damage. Year by year we learn more and more about these diseases and devise better means of combating them. So, while the beginner may think that growing grapes is not worth the candle, because of the constant warfare with pests, he may be assured by the fact that a considerable number of men, in nearly every part of America where general farming is an industry, grow grapes despite their insect and fungous parasites.

BLACK-ROT

This is the most widely distributed and the most destructive disease of the grape in eastern America. The parasite gains entrance to the grape plant by means of minute spores distributed chiefly by wind and rain. The spores pass the winter in mummied grapes, on dead tendrils, and on small dead areas on the canes. In the spring the fungus begins growth on the young leaves, where it forms brownish spots about a fourth of an inch in diameter, or black spots on the shoots, leaves, petioles, and tendrils. Later the disease spreads to the fruits, not usually attracting attention until the berries are half grown. Soon, however, the berries turn black,

shriveled, and are covered with small black postules that contain the summer-spores. Figure 15 shows the disease as it appears on the fruits. Species and varieties vary greatly in resistance to the disease, some of the tender Vinifera being less susceptible than the more vigorous native sorts.

In various regions it is impossible to grow some varieties because of black-rot. Moist, hot, still air creates conditions under which this rot is hard to control. In these conditions an ounce of prevention may be worth a pound of cure; much can be accomplished by taking pains to destroy leaves, canes, and berries that harbor the winter spores. As for the rest, regular applications of bordeaux mixture, as per the spray schedule on page 105, prevent serious damage. Since the spraying is wholly preventive, success depends largely on careful timing—the bordeaux mixture must be on the leaves just before the spores. Very fortunately the time to spray for black-rot is identical with the time to spray for the two mildews now to be discussed.

DOWNY-MILDEW

This disease rivals black-rot in virulence in eastern vineyards, where it is found on all varieties and in all vineyards, but is not always abundant enough to be a pest worth bothering about. Like black-rot, downy-mildew attacks all the tender parts of the vine but does most injury to the leaves; it is usually less destructive than black-rot. It is first seen on the upper surface of the leaves as greenish-yellow irregular spots, which later become reddish-brown. At the same time a thin, white downy growth shows on the underside of the leaf. When there is much downy-mildew on the foliage, the plant slowly starves, the vine's strength being so sapped that neither fruit nor wood make a normal growth and neither ripen well. Injury to the shoots is so serious that in the autumn there may not be good canes to put up.

But it is the grape berries that suffer most. The berries are attacked when about half grown, soon becoming covered with the gray down of the fungus. At this stage of the disease on the fruits it is the 'gray-rot' of the grape-grower; later the fungus causes a

brownish-purple spot that soon covers the whole grape and becomes 'brown-rot.' Downy-mildew, like black-rot, spreads rapidly and does most damage in still, moist weather; where winds blow, this mildew is inconsequential. Figure 16 shows the work of downy-mildew.

Pure-bred native grapes suffer very little from this disease, but Vinifera and hybrid varieties show little resistance. This was the



Fig. 16. The work of downy-mildew.



Fig. 17. The work of powdery-mildew.

first of the American diseases to attack grapes in Europe, where it is called *peronospora*. All European grape-growers must fight this disease of the vine.

The remedy, or rather the preventive, is the same as that recommended for black-rot—two sprays of bordeaux mixture—as given in the spray schedule at the end of this chapter. In addition all diseased leaves and fruits should be destroyed by plowing under in autumn or spring.

POWDERY-MILDEW

Perhaps powdery-mildew should have been put first among diseases of the grape, since when 'mildew' is applied to the grape

without a qualifying word this is the one usually meant. It has been a parasite on American grapes so long that most native grapes are little hurt by it; whereas the European grape and all varieties having *Vinifera* blood are susceptible and quickly ruined by it. This is the 'American scourge' which ravished the vineyards of Europe in the middle of the last century. An immigrant from America to France in the 1850's, its life history was first worked out in that country and there the name *oidium* was given it, a name which persists in the Old World and in California, where it is as disastrous to grapes as in France. It is a particularly troublesome pest on wine grapes, on which, even if the grapes have a touch of it, a moldy smell taints the wine.

Powdery-mildew attacks all tender green parts of the vine—leaves, shoots, or fruits. One usually sees it first on the upper surfaces of the leaves as a grayish powder—hence the name. Affected leaves sooner or later turn brown and fall, so seriously checking growth that the vine is starved, the shoots stunted, and neither berries nor wood ripens properly. On the berries, it appears in grayish scurfy spots speckled with brown; the berries do not develop, but burst open, showing the seeds. On the fruits, powdery-mildew is distinguished from downy-mildew by the color of the diseased parts, by the fact that it does not attack berries after they begin to turn color, and by the fact that the diseased berries are hard rather than mushy soft. Figure 17 shows the work of powdery-mildew.

Powdery-mildew is of further interest to grape-growers and plant-pathologists because it was the first fungous disease to be successfully combated with a chemical. The chemical in this case is sulphur, ground fine, which is dusted over the whole vine. In Europe and California, powdery-mildew is fairly well controlled with from 2 to 6 sulphurings. In eastern America, where it is seldom very troublesome, it is kept well in check with bordeaux mixture as applied for black-rot or downy-mildew. Unlike the two last-named diseases, this one thrives in dry rather than moist climates.

ANTHRACNOSE

The last of the several serious diseases to be discussed is anthracnose, which grape-growers commonly know as 'bird's-eye-rot' because of the spots on grape berries. The disease also attacks leaves and shoots. It usually appears first on leaves in small, dark brown spots with a black margin. Later, the 'bird's-eyes' show on the fruits. The berries become hard, more or less wrinkled, and the 'eyes' burst, showing the seeds, much as in powdery-mildew. The disease is widely distributed in eastern America, but seldom causes great loss, since most varieties are nearly immune to it. Spraying with bordeaux mixture, as for the several other fungous diseases, keeps anthracnose in check.

MINOR AILMENTS OF THE GRAPE

There are perhaps a half dozen minor diseases of the grape which are sometimes troublesome. In western New York and along the shore of Lake Erie in Pennsylvania and Ohio *dead-arm disease* causes some trouble. The name describes the disease fairly well. A fungus causes the death of an arm of a vine. The disease is controlled by cutting out the affected parts as soon as the trouble appears, easily identified by small yellow leaves, much crimped about the margin. Sprays for other diseases help to keep this one in check.

Crown-gall, a disease which causes galls on the roots of many wild and most cultivated fruits, takes some toll from the grape. This trouble need seldom be reckoned with in the grape, though when it is found on roots of vines being set, it should, of course, be cut out. Reputable nurserymen do not sell vines with galls on the roots.

Chlorosis, or *yellow-leaf*, is a physiological ailment very disturbing when it appears in a vineyard. The leaves of a vine turn yellow; brown, dead patches appear; and the leaves curl and often drop. When a vine loses its leaves several seasons in succession, it dies. The trouble is most common in wet spots in a vineyard or in wet seasons. This ailment, or one very similar, is common in

France, where the cause is ascribed to too much lime in the soil. Fortunately, few varieties ever show chlorosis. The French remedy is to graft susceptible varieties on stocks which grow well in limestone soils.

Another physiological ailment is *shelling* or *rattling*, the premature dropping of grape berries whereby a large part of the crop is lost. The cause of shelling is constitutional; it may occur on rich land or poor, on wet or dry soils, heavy or light land. There is no remedy or preventive. Fortunately, only a few varieties are badly affected, of which Concord is the most important.

The fight with insects and fungi constitutes the most discouraging part of grape-growing. Yet the recital of what these enemies are and the means of keeping them under control, while impressive, is not more frightening than would be a catalogue of the diseases of other fruits and of most other cultivated crops. In no vineyard are all, or many, insects present; no pest is virulent every year; and all, literally all, can be checked by one means or another. To be sure, many vineyardists get by without ever spraying, but the successful ones who do not fight for their crops are few and far between.

GRAPE SPRAY SCHEDULES

In almost no two vineyards do grapes need, year in and year out, the same sprays. Certainly this is true of any two states and in a large state in two distant parts of it. A grape-grower must know his pests and the sprays that will control them. This information has been given, rather fully, in the first pages of this chapter. As this manuscript goes to press the *Report of the New York State Horticultural Society* comes to hand. In it are spray schedules for the eastern and western parts of New York, giving latest information of spraying grapes for the northeastern part of the United States. The two schedules were prepared by workers in the New York State Agricultural Experiment Station, Geneva, New York, and the Cornell Experiment Station, Ithaca, New York.

A glance through these schedules shows what a grape-grower ought to have in his arsenal as chemical weapons. On the Pacific

TABLE IV. GRAPE SPRAY SCHEDULE FOR HUDSON RIVER VALLEY

TIME OF APPLICATION	MATERIALS	ENEMY
Just before blossoms open	Bordeaux mixture, 4-4-100	Black-rot Downy-mildew
As soon as the berries set	Bordeaux mixture, 4-4-100	Black-rot Downy-mildew
When berries begin to touch in clusters	Bordeaux mixture, 4-4-100	Black-rot Downy-mildew Powdery-mildew
Special leaf-hopper spray. When most of leaf-hopper eggs are hatched	Nicotine sulphate, $\frac{3}{4}$ pint Resin fish oil soap, 2 lbs. Water, 100 gals.	Leaf-hopper
Two weeks later	Bordeaux mixture, 4-4-100	Black-rot Downy-mildew Powdery-mildew
Special rose-chafer spray. Apply as soon as the beetles appear	Confectioners' glucose, 25 lbs., or cheap molasses, 2 gals. Lead arsenate, 5 lbs. Water to make 100 gals.	Rose-chafer

Further applications to be determined by weather conditions and previous control of mildews and black-rot.

Leaf-hopper Note: Leaf-hopper is best controlled by nicotine spray applied with a hooded boom.

Coast, he would add finely ground sulphur for powdery-mildew. Some grape-growers might add cascain or whale-oil soap, to cause the sprays to spread and to stick better. Most of these materials can be purchased at local dealers, or, certainly, from mail-order houses. If one prefers to mix his own sprays, bulletins giving directions can be had from state experiment stations or from the United States Department of Agriculture.

SPRAYING MACHINERY

Several pages might be written in a discussion of spray pumps and nozzles, of which there are many. Nearly all sprayers and nozzles are good—take your choice of the various kinds. The size should match the size of the vineyard. There are now several power sprayers rigged for work in vineyards in which two or even four

TABLE V. GRAPE SPRAY SCHEDULE FOR THE CHAUTAUQUA GRAPE REGION

TIME OF APPLICATION	MATERIALS	ENEMY
Special berry-moth spray Just as soon as the fruit has set Make special effort to place spray on the clusters This is a special berry-moth spray and can be omitted if the pest is not present	Lead arsenate, 1½ lbs. Resin fish oil soap, 1½ pounds	Berry-moth
When the root-worm beetles first appear in numbers, usually from a week to ten days after fruit has set	Bordeaux mixture, 2-4-100 Calcium arsenate, 3 lbs.*	Root-worm Berry-moth Powdery-mildew
Ten days to 2 weeks later	Bordeaux mixture, 2-4-100	Powdery-mildew
Special leaf-hopper spray When most of the leaf-hopper eggs are hatched	Nicotine sulphate, ¼ pint Potash fish oil soap, 2 pounds Water, 100 gals.	Leaf-hopper
Special rose-chafer spray Apply whenever the beetles appear	Confectioners' glucose, 25 lbs., or cheap molasses, 2 gals. Lead arsenate, 5 lbs. Water to make 100 gals.	Rose-chafer

* If this application is made after July 1, great care must be used to avoid placing an excess amount of material on the fruit.

Leaf-hopper Note: Leaf-hopper is best controlled by a nicotine spray applied with a hooded boom.

rows are sprayed at once. For small vineyards, garden or knapsack sprayers may be used, but they are seldom efficient. The amateur, if possible, should hire a professional with a power sprayer to do his work. A misty spray that covers every part of a vine, including the underside of the leaves, is what is wanted. It is a great comfort to feel sure that your spraying is effective.

9. Pruning

FROM the day a grapevine is set in a vineyard and for as long as it lives, it is subject to severe discipline. If one is content with small-clustered, poorly flavored grapes, vines growing as in the wild state will give something of a crop; but if one wants large, symmetrical bunches, with closely packed berries, ripening to sugary perfection, the vines must be kept under perfect control. They must be pruned and trained so that every leaf and every cluster of grapes has all the sun and air the site of the vineyard permits; in winter all the needless wood must be cut away; it may be that in summer luxuriant shoots must be pinched back or removed; certainly there must be spring and summer tying of canes and shoots.

A vineyard seems to an unexperienced onlooker the most complicated planting of any of the fruits. Long, thick growths of unpruned vines in autumn, cut to short, bare arms and canes in winter; the seried ranks of trellises made of posts and wire; each vine a canopy of foliage and fruit in summer. All this regimentation, compared with wild vines, confuses the beginner and makes grape-growing seem a most difficult art—which, indeed, it is, if the grower does not know all the necessary operations.

The chief disciplinary measures in growing grapes are *pruning* and *training*, which, though done at one and the same time, accomplish two quite different objects. One prunes grapevines to increase the quantity and quality of the fruits; one trains grapevines to keep them under manageable control in the vineyards. Grape-growers combine the work to achieve the two objects when they prune; but it is well to keep the two conceptions in mind.

There is a legend that Saint Martin, patron saint of the vine, discovered quite by accident that grapevines produce most fruit and are most easily cared for when pruned. It was an ass that led him to this important discovery. Saint Martin planted two vineyards, among the very first to be set in ancient Gaul. In one, he permitted his ass to browse. The ass was fond of the tender shoots of the grape, as all animals are, and kept the vines closely pruned. In the other vineyard, the vines grew at will, clambering hither and yon without hindrance. The vineyard pruned by the ass produced the most grapes, and, more important, from them the wine was much better. Saint Martin's vineyard and his wines became famous, and soon the monks in all Gaul, so the story goes, were pruning their vines.

SOME GENERAL CONSIDERATIONS

Pruning vines in their first year in the vineyard, which, as we have seen, consists in cutting the vines back to two buds, helps very materially in bringing them in bearing. It also insures the vigor of each vine and uniformity in the growth of each. If there are weak vines among those planted, in spite of care to weed them out, pruning helps them to overtake their vigorous neighbors; if weak plants are left unpruned they usually remain diminutive and petty. In pruning tree, bush, and bramble fruits in a home garden, most gardeners err on the side of too much pruning; in the home vineyard, the average gardener errs on the side of pruning too little.

The great object in pruning is to regulate the quality of the crop, an object the amateur should keep in mind. Unpruned, the vines set far too many bunches, on which the grapes are small and do not ripen or color well, making them unattractive for the table. Nor are grapes from unpruned vines nearly as good for wine, particularly because they are lacking in sugar: for bunches on unpruned vines do not receive the light and heat that they get on pruned vines. Again, there is reason to believe the shorter the trunk and cane, the closer to the ground, within reason, the better the grape. The fox in Aesop's fable said of the grapes he

could not reach: 'They are too green and only good for fools.' It would seem the foxes of ancient times knew that grapes high up on the vine are green and small. Evidently the Greeks of Aesop's time pruned their vines to improve the fruit.

Pruning regulates the quantity of grapes because it helps to prevent alternate bearing. Abnormally large crops are often followed by partial crop failures: if the large crop is reduced by pruning, the chances of the evil consequences of overbearing are lessened. Some varieties naturally bear better every other year; pruning helps avoid this fault.

In books and bulletins on grape-growing, one reads much about 'pruning for wood' and 'pruning for fruit.' What do these two expressions mean?

PRUNING FOR WOOD AND PRUNING FOR FRUIT

Some grapes produce too much fruit in one season, after which the vines are exhausted. If this goes on year after year, the plants may be permanently injured. Pruning lessens the struggle for existence in the parts of the plants and increases the vigor of the parts that remain. This is *pruning for wood*. The weaker the plant the more severe the pruning should be. Vines are pruned for wood between the fall of leaf and the swelling of buds the next spring.

Excessive vegetative vigor in any fruit usually reduces fruitfulness. Too great vigor is indicated by long, leafy, unbranching shoots. Vigor in such vines can be lessened by withholding fertilizers, stopping tillage, and by pruning. Pruning to decrease vigor, or *pruning for fruit*, is done by cutting out shoots in the summer, the 'summer pruning' of many vineyardists.

In summer new shoots bearing newly developed leaves are removed. The theory is that these young shoots have been developed from food stored up the season before, and that until they are large enough to function fully they are parasites. When such shoots are removed, the plant is freed of material, which, used in producing foliage, has given little in return. The vigor of the plant is checked and fruitfulness is increased. Early summer is

the time for summer pruning, before the leaves have passed from the light green of new shoots to the dark green of maturing leaves.

HOW GRAPES ARE BORNE

In pruning, the grape-grower should keep in mind the manner in which the grape plant bears its crop, since pruning is largely dependent on the fruit-bearing habit. The grape is unique in fruit bearing. Shoots, leaves, flowers, and fruit are produced in a short season from a single bud. This bud is borne on the wood of the previous year's growth.

Pruning is a problem to be solved mathematically. Fifteen pounds of grapes, of an American variety, is a fair average per vine. Each bunch weighs from a quarter to a half pound. From 30 to 60 bunches are required to produce 15 pounds, to obtain which 15 to 30 buds must be left on the canes, each of which should bear one or two bunches of grapes. These buds may be selected as the pruner chooses, but usually according to one or another method of training. In essence, pruning is thinning.

TRAINING THE VINE

Grape-growers have given vines special training since the beginning of grape-growing. According to Milton, Adam and Eve trained vines in the Garden of Eden

. . . they led the vine
To wed his elm . . .

In Italy and southeastern Europe, one still sees the grape clambering over elms and mulberries as they must have been trained to do in ancient times. In France and Germany, vines seldom climb or clamber, and almost never are trained on trellises. In the vineyards of these countries each vine is usually a bush-like plant supported by a stake. For the most part, only American grapes are grown on wire trellises. A clipped and spurred vine on a wire trellis must be an object of astonishment to tree and bush fruits in a garden.

Vines are trained on trellises to keep the vines off the ground.

to put them out of the way of vineyard tools, and to facilitate the work of tilling, spraying, pruning, and harvesting. A visitor from the eastern states to Europe, or to California, is amazed to see how much more trouble it is to prune and train grapes from native species, still hardly domesticated, on wire trellises than to support European grapes, if at all, on stakes.

Training really begins in the spring of the second year, when trellis posts are set and a single wire is put up. The stake of the first summer is no longer sufficient support. The grower must now make up his mind which of the so-called systems of training in use in eastern America suits his needs best. However, since the trellis is much the same for all, we may as well, first, dispose of this rather costly part of a vineyard.

The posts may be set, and at least one wire put up, as we have just said, at the beginning of the second season. Some prefer to cut the vines, especially of weak-growing varieties, back to two buds again, and tie them to stakes the second summer, and put up the trellis at the beginning of the third.

In the old days, grape-growers chose chestnut posts, but now, since chestnut cannot be had, cedar, oak, or locust make the best wooden posts. More and more, cement or steel are taking the place of wood. Steel is best for a small vineyard. Steel posts are neat in appearance, easily set, are not heaved out by the frost, and the wires are easily attached. If good posts are used, the distance apart should permit three vines between each two. The posts are from 6 to 8 feet long; if of wood, the heaviest should be saved for the ends of rows. End posts are set with a spade, but the intermediate ones, sharpened at the butts, are driven into holes made with a crow-bar. In driving, the workman stands on a wagon or truck and swings a 12-pound maul. The posts are driven to a depth of 2 feet, the end posts 3 feet. All must be driven down each spring, so when they are first set they stand a little higher than in the later seasons.

Now comes the tiresome task of bracing the end posts, very necessary, for the wires must be taut and firm and must be stretched each spring. Perhaps the simplest way to brace an end

post is to use a four-by-four timber, notched to fit the post half-way up from the ground and extending obliquely to the ground, where it is held by a four-by-four stake. Figure 18 shows a good brace for end posts.

Four sizes of wire are used on trellises; nos. 9, 10, 11, and 12. Number 9, the heaviest, is used for the top wire, with the lighter



Fig. 18. A well-braced trellis.

ones lower. The number of pounds for a piece of land is easily calculated from the figures below, which give the length of wire in a ton:

No. 9	34,483 ft.	No. 11	52,353 ft.
No. 10	41,408 ft.	No. 12	68,493 ft.

Galvanized wire is the most durable and it alone should be used. The wires are fastened to the end posts by winding once around, and then each wire is looped about itself; they are fastened in wooden posts between the end ones by fence staples, tight but not too tight, since they must be stretched each spring. An acre requires from 9 to 12 pounds of staples. Cement and steel posts have special contrivances to hold wires. The wires are placed on the windward side of posts and on the up-hill side if the ground is rolling. The distance between wires depends on the method of training.

The wires are stretched taut with a wire-stretcher. Before winter sets in each autumn, the wires at the end posts should be loosened to allow for contraction in cold weather, otherwise the posts will be pulled out of place. In the spring, the sagging wires are pulled taut at the time posts are being driven down. Unless the wires are kept tight during the growing season, foliage, and fruit may be injured by whipping in strong winds.

The canes are tied to the wires in early spring, the shoots in summer. The tying may be done with raffia, cord, willow, corn husks, carpet rags, or wire. An ingenious person usually contrives a tie of his own to suit his conditions. Different material and methods are used for spring and summer tying, since the canes in the spring are tied firmly, while the shoots in the summer are tied rather loosely to permit growth in diameter. The spring tying is done early to prevent breaking off swelling buds.

We now come to the rather complicated methods in vogue in training grapes in eastern America. Of these there are 8 well-recognized methods, and possibly as many more which are combinations of them. To avoid errors, the grower must know well the different parts of a vine important in pruning. These are as follows, summarized from Chapter 2:

Trunk, the main stem.	Spur, a cane cut back to one or two buds.
Arms, the main branches of the trunk.	Suckers, shoots coming from the roots.
Shoots, leafy growths of the current season.	Water sprouts, shoots springing from buds along the trunk.
Canes, dormant, one-year-old wood—the shoots of the preceding season.	Tendril, the slender, leafless coiled organ by which the grape climbs.
Old wood, a part of a vine more than one year old.	
Head, the top of the trunk from which arms or canes arise.	

SYSTEMS OF TRAINING

The practices in training grapes are widely different, as, indeed, they should be with species so variable. In all methods, the grape-grower takes great liberties with nature, completely transforming the vines from their natural habit of growth. Happily, the grape

endures cutting so well that any man may follow his whims to his heart's desire, without greatly injuring his vines. All styles of training fall into two groups: Shoots upright; shoots drooping.

The eight leading styles of training grapes in eastern America, grouped as to disposition of shoots, are:

SHOOTS DROOPING

1. Single-trunk, Four-cane Kniffin
2. Two-trunk, Four-cane Kniffin
3. Umbrella Kniffin
4. Y-stem Kniffin
5. Munson

SHOOTS UPRIGHT

6. Chautauqua Arm
7. Keuka High Renewal
8. Fan

The four best of these are the 1st, 3rd, 6th, and 7th. One of these four ought to suffice for any grower of American grapes. Of

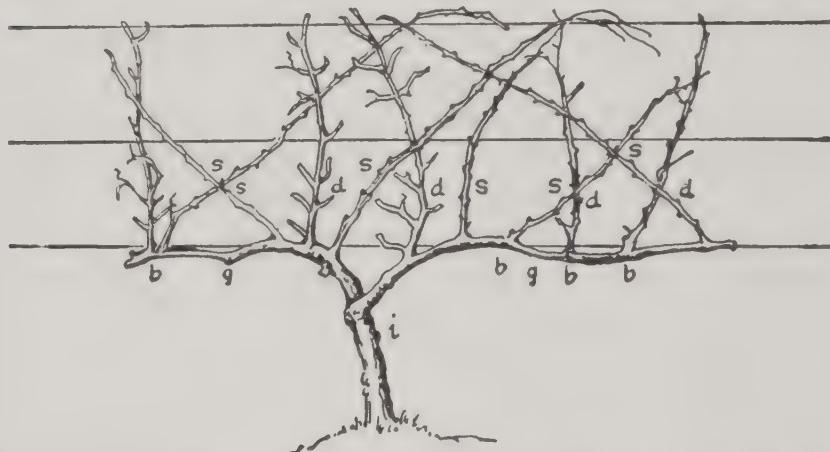


Fig. 19. A grapevine ready for pruning: *i*, the stem; *g*, arms; *d*, canes; *s*, shoots; *b*, spurs.

the four, the Single-trunk, Four-cane Kniffin method is far and away the best, especially for small vineyards.

In all methods of training, the fruiting wood must be renewed from year to year. Renewals may be made from canes or spurs. Either can be used in any method of training.

Renewal by canes is made by taking one or more canes, cut to the desired number of buds, to supply bearing shoots. By this method the bearing wood is renewed each year. Renewal canes may be taken from the head of the vine or from the ground.

though they are taken from the ground only when vines are laid down for winter protection. Canes may be renewed as long as a vine lives, but care should be exercised to keep the renewal spurs as short as possible.

In renewing by spurs, permanent arms are established to right and left from the trunk. Shoots on these arms are not permitted to remain as canes but are cut back to spurs. Two buds are left in the winter pruning, both of which will bear shoots; the lower one is not permitted to bear fruit but is kept to furnish the spur for the next season. The shoot from the upper bud is cut away in winter pruning. The objections to renewal by spurs are that it is difficult to replace spurs and the bearing wood gets farther and farther from the trunk.

We are now ready to discuss the most commonly used methods of training. Figure 19 shows a grapevine ready for pruning.

THE SINGLE-TRUNK, FOUR-CANE KNIFFIN SYSTEM

William Kniffin, a stone mason, whose home was at Clinton-dale, New York, was an amateur grape-grower in the middle of the last century. He was a born experimenter and in time found a way of training grapes that gave him a large yield and bunches of large size. In 1850 he made his discovery known in horticultural papers and acquired fame in viticulture that lasts down to the present time. Four ways of training grapes bear his name.

In the *Single-trunk, Four-cane Kniffin* method, one trunk is carried to the lower wire the second year and tied. The third year a cane is tied to the top wire. The lower wire, by the way, is 3 feet from the ground; the upper one, 2 feet higher. The cane is tied to the top wire; the trunk loosely to the lower. At the beginning of the fourth year, as shown in Figure 20, the vine consists of a stem growing from the ground to the top wire. All but two canes and two spurs of two buds each have been cut away below each wire level. As growth is most vigorous at the top of the stem, four to six more buds are left on the two upper than on the two lower canes.

The trunk is tied loosely to the wires, and the four canes are tied along the two wires to right and left of the trunk. They should be tied tightly toward the trunk, so that they cannot slip out of the tie. If conditions for growth are unfavorable before the tendrils take hold of the wire, a second tying may be necessary.



Fig. 20. The Single-stem, Four-cane Kniffin method of training.

Since most of the grapes in the Four-cane Kniffin method are borne on the upper canes, some growers use only two canes, in which case the trunk is carried as quickly as may be to a head at the top wire. When the vines are pruned at the close of the third year, two long canes are left at the head with two renewal



Fig. 21. The Umbrella Kniffin method of training.

spurs. These long canes are drooped over the upper wire obliquely down to the lower wire to which they are tied, forming an umbrella-shaped top as shown in Figure 21. In this way of training, the *Umbrella Kniffin*, leaf surface and fruiting wood are reduced to the minimum so that the yield is low unless fertilizers are used.

The Two-trunk *Kniffin* is a modification of the Four-cane *Kniffin*, sufficiently explained by the name. It is also known as the *Double Kniffin* and the *Improved Kniffin*, introduced as a method to increase the yield. In experiments carried on by the New York Experiment Station, not so much fruit was borne, the bunches were smaller than in the Four-cane *Kniffin*, and did not ripen so well.

The first growers of American grapes, early in the nineteenth century, trained their vines as best they could according to European methods. Toward the middle of the century, a method called the *Horizontal Arm Spur* was introduced. Arms were laid to right and left on a low wire with more or less permanent spurs, from each of which two shoots were trained upright to a higher wire. The spurs were so troublesome that eventually a modification called the *Chautauqua Arm* method took the place of the old Horizontal Arm. Experiments have shown over and over again that even in the Chautauqua Grape Belt, home of this method, it is more costly, the yield not so high, or the product so good as in the Four-cane *Kniffin*, yet thousands of acres of grapes are grown under the Chautauqua Arm method, so it must be discussed in detail.

THE CHAUTAUQUA ARM METHOD

The trellis for this method has two wires: the lower one 20 inches from the ground, the upper one 34 inches above the lower. The trunk reaches only to the lower wire, brought there by the end of the second or third summer. From this trunk permanent arms are laid off to right and left, having been formed from two strong shoots arising from the head of the young trunk, which, of course, are canes the season after the head is formed. These two canes are twisted loosely around the wire and tied; both are shortened in accordance with the vigor of the vine; from this on they are 'arms.'

The season after the arms have been laid down, three or four canes growing from them are left to bear the crop. The arms

should be shortened to within several inches of the head. Two spurs are left at intervals along the arms to furnish fruiting canes for the season following. All fruiting canes are tied obliquely to the upper wire. Suckers and water-sprouts growing from below the head should be removed. Year by year, canes originate farther and farther from the head, so that eventually it is necessary to lay down new arms. This is done by removing the old arm and laying down a cane to take its place. The illustration in Figure 22 shows better than words how vines are trained by this method.

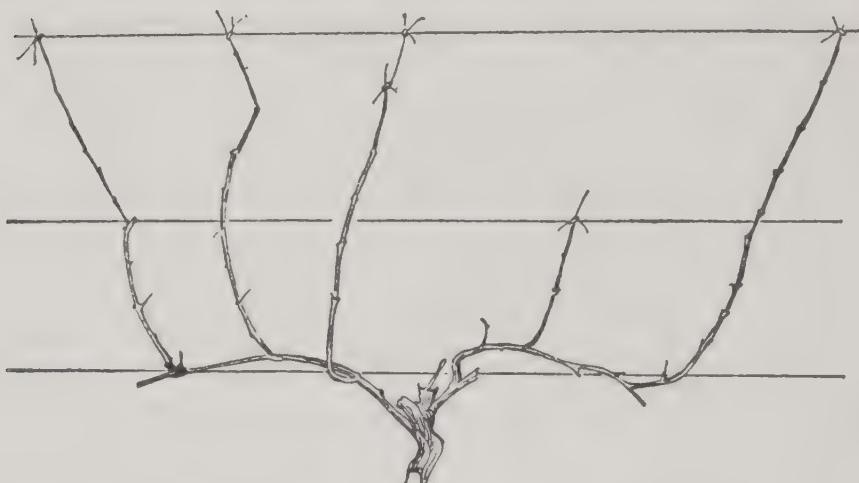


Fig. 22. The Chautauqua Arm method of training.

The Chautauqua Arm way of training a vine is not as good as the Four-cane Kniffin because it is more complicated, and requires more pruning and tying in both the dormant period and in the summer. Summer tying is especially arduous, particularly since strong winds blow down the fruiting canes more freely than in the Four-cane Kniffin in which the canes are drooping.

THE KEUKA HIGH RENEWAL METHOD

The *Keuka High Renewal* way of training is much used about the Finger Lakes in western New York, center of the Champagne industry in the United States. This is the best of several types of training vines by high renewals. As with the Chautauqua Arm

way, the Keuka High Renewal is gradually being superseded by the Four-cane Kniffin.

In the Keuka High Renewal method, a two- or a three-wire trellis is used; the lowest wire is 20 inches from the ground, the two higher ones, if three wires are used, at little greater distances above. The trunk is a little lower than the lowest wire, and from its head canes are laid off to right and left along the lowest wire. Renewal spurs are left near the head of the trunk for next year's



Fig. 23. The Keuka method of training.

canes. As the new shoots grow from the canes they are tied to the two higher wires. In this way of training, most of the old wood is cut away each year so that the vine is renewed almost to the ground. Figure 23 shows how the trained vine looks after pruning.

In comparative tests of the several ways of training grapes, the Keuka High Renewal is one of the poorest for vigorous growing sorts, but varieties which make short growths, as Delaware and Catawba, grow very well trained this way, and rather better in any way in which the shoots are upright. This method, like the Chautauqua Arm, requires much summer pruning. The trellis for the Keuka High Renewal, if three wires are used, is costly.

PRUNING ROTUNDIFOLIA GRAPES

The *Rotundifolia* grapes of the South are so different in growth that they must be treated in pruning and training in ways to

suit their special requirements. They may be trained spread out in an overhead canopy, or spread over a vertical trellis. In the overhead ways of training, a trunk is grown seven feet high beside a permanent post to a wire or slats. When the vine has reached the top of the post, a head is formed from which shoots are

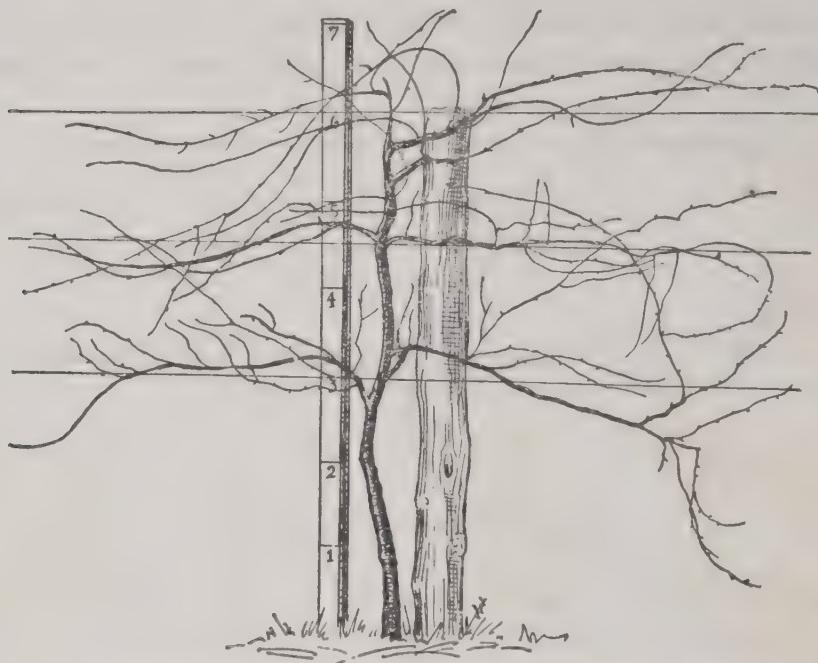


Fig. 24. A *Rotundifolia* vine trained in the six-arm renewal method.

trained to spread out as the spokes of a wheel radiate from the hub.

In the upright way of training *Rotundifolias*, substantial posts are set 7 feet high. Three wires are strung on these posts 24, 42, and 60 inches, or thereabouts, from the ground. A vertical trunk is grown to the top wire, from which horizontal canes are laid off to the right and left along the wires. Figure 24 shows a *Rotundifolia* vine trained with six arms. The trellis is put up much as trellises in northern vineyards, and much the same methods of renewing fruiting wood is used. More and more, two wires instead of three are used. Plate ix shows a four arm renewal training.

The ways of training and pruning *Rotundifolias* are far from



PLATE IX. *Rotundifolia* grapes trained to two wires



PLATE X. A vineyard in a Coastal Valley in California

being standardized in the South, each grower doing the work much to his fancy. More often than not the vines cover fences, arbors, or summer houses, a few vines furnishing an ample supply of grapes for home use.

THE WORK OF PRUNING

Pruning is mostly done in winter. It can be delayed until the buds begin to swell, but by this time the sap is flowing and the plants 'bleed' so freely that cutting the vines is unpleasant. On the other hand, vines should not be pruned while they are frozen, since the brittle wood is then easily broken. The best time in northern climates is after immature wood is injured and can be readily removed.

A man working alone usually finds that the work is more readily done if he goes over the vine twice. The first time over, he severs the wood from the vine, leaving the number of buds desired. The second time over, he cuts tendrils and separates the cut canes from each other so that the prunings may be easily removed. If two men work together, the more skillful one performs the first operation. This winter work is all done with pruning-shears, of which there are several good kinds.

The most disagreeable part of pruning is 'stripping the brush' and getting it out of the vineyard. The prunings cling to the wires with exasperating tenacity and are pulled loose by a peculiar jerk, the knack of which is learned by practice, and piled between the rows. It is important that these stripplings be taken out of the vineyard, as best one can, before growth starts in the spring, otherwise young buds may be broken off the vine.

RENEWING TRUNKS

It becomes necessary now and then to renew trunks as the vineyard grows old, since often they become so gnarled and crooked as to interfere with cultivation; or suffer from injuries of one kind or another. Renewals are easily made from suckers. These are treated just as were the young vines in training them on the trellis. In two years the new trunk can bear a part of the crop, and in three years the new trunk should take the place of the old one.

Of course a trunk, or even a vineyard, can be renewed by grafting. This is the only way to change a vineyard when the vines are not of the variety wanted. It is amazing to see how quickly and how well a vineyard of halt and maimed vines, or of a variety not wanted, can be completely rejuvenated by grafting in a few years —in no other fruit is the energy of nature seen to better advantage.

PRUNING VINIFERA GRAPES

The author confesses at once that he has never pruned a Vinifera grape, except in an eastern vineyard, nor has he seen anyone do so. Those who grow these grapes on the Pacific Coast should seek advice from their experiment station, from a county agent, or an experienced grape-grower. The following is a very brief discussion of some of the most frequently used methods, as set forth in the bulletins of the California Experiment Station, Berkeley, California.

The methods of pruning Vinifera grapes are divided into two general ways, according to the arrangement of arms on the trunk. In the commonest way, especially in the home vineyard, there is a head to the trunk from which all the arms arise as nearly as possible from the same level. In the other main method the trunk is 4 to 8 feet in length, with arms distributed more or less regularly along its length. The vines in the first method are said to be *headed*; in the second, the trunks are called *cordons*.

When the headed vines are from 2 to 3 feet in vertical length, the heads are said to be *high*; from 1 to $1\frac{1}{2}$ feet they are *medium*; and *low* when lower than 1 foot. The cordons may be *vertical* or *horizontal*, according to the direction of the trunk, which is from 4 to 8 feet long. The horizontal cordons may be single or may have two branches. Figures 25 and 26 show examples of cordon pruning.

In a headed vine, the arms may be symmetrical in all directions at an angle of about 45 degrees; such a head is said to be *vase-formed*. Figures 27, 28, and 29 show forms of head pruning. This form is used in most of the Pacific Coast vineyards whether they are being grown for wine, raisins, or to supply the table. This is



Fig. 25. Horizontal cordon with fruit spurs.

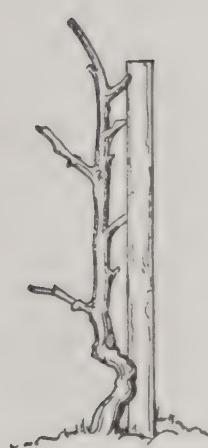


Fig. 26. Vertical cordon; young vine pruned.

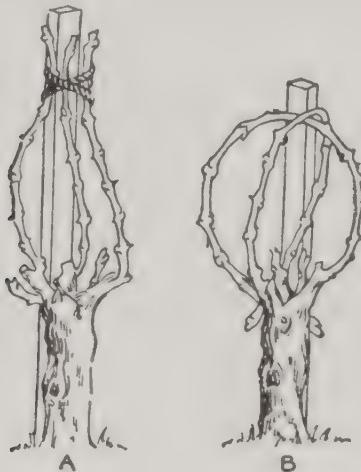


Fig. 27. Forms of head pruning: A, Vertical fruit canes and renewal spurs; B, Bowed fruit canes and renewal spurs.

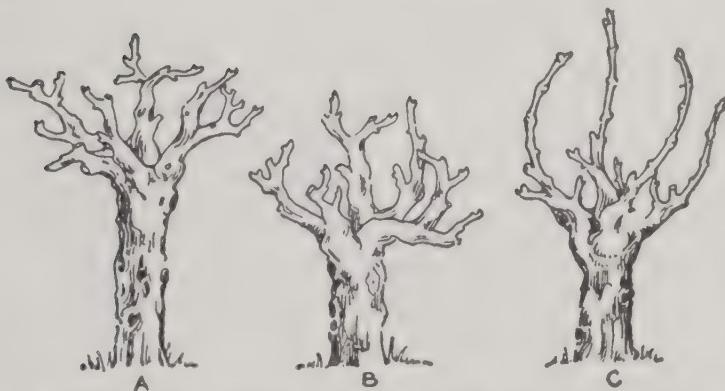


Fig. 28. Forms of head pruning: A, Spur pruning with high trunk; B, Spur pruning with medium trunk; C, Half-long with medium trunk.

the form of planting most suitable for planting in squares to permit of cross cultivation. When vines are trellised, making cross cultivation impossible, the arms are given a *fan-shape* in a vertical plane. These fan-shaped vines are more easily worked than when arranged in any other way on a trellis. Figure 30 shows a fan-shaped head.

In the upright cordon methods of training, the arms are as evenly spaced as possible on all sides of the trunk from the top

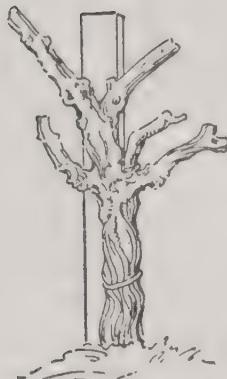


Fig. 29. Pruning for vase-formed head.

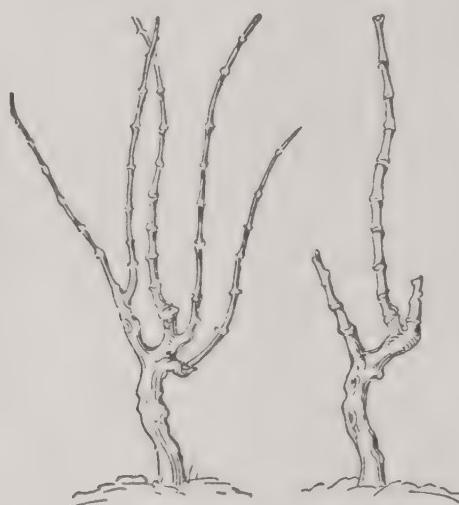


Fig. 30. A fan-shaped head, before pruning and after pruning.

to within 12 or 15 inches from the bottom. On the horizontal cordon, the arms are arranged similarly, with an effort made to keep them on the upper side of the trunk only.

These two general systems are again divided and subdivided, chiefly in accordance with the management of canes and spurs. In one method spurs of one, two, or three eyes are left for fruiting; this method is called *short* or *spur* pruning. In another, long canes are left to bear fruit; this is *long* or *cane* pruning. In all of these, or any other methods, spurs are left whenever and wherever replacements are needed.

Other modifications that must be mentioned are those that have to do with the way in which the fruit-bearing canes are dis-

posed of. They may be tied up vertically to a stake driven at the foot of each vine, or bowed in a circle and tied to the same stake; or they may be tied laterally to wires stretched along the rows in a horizontal, ascending, or descending direction.

On the Pacific Coast, even more than in eastern America, the choice of a method of pruning depends on a variety of circumstances. Most frequently the variety is the deciding factor. But convenience in management, whether on own roots or grafted, on rich or poor soil, and the size of the bunch wanted are all important.

The time to prune, the ways of making trellises, and the materials used for them are much the same in the West as in the East. The owner of a home vineyard has much latitude in all the details of pruning *Vinifera* grapes. The accompanying illustrations should help him much, but he will sooner or later, if inexperienced, seek advice from the sources mentioned at the beginning of this discussion.

10. Old World Grapes in Eastern America

As was said in the preface, this book is almost wholly concerned with domesticated grapes from our native species. Yet, despite the many good varieties of our native grapes, who in eastern America would not grow the grapes of the Old World, even as they are grown in California, if he could? It is impossible in eastern America to grow any of the grapes derived from *Vitis vinifera* as well as they are grown on the Pacific Coast, but some of them can be grown with fair success.

Why should we want to grow these exotic vines? Why not be content with our admirable native grapes? There are many answers to these questions, which, at the risk of some repetition of what has been said in earlier chapters, we again summarize.

The fruits of European grapes are better in every character than those from native species. Throughout the world, grapes are grown chiefly for the wine-press. Only in eastern America are grapes for the table of any considerable commercial importance. While good wines can be made from many native grapes, only Champagne, as made in eastern America, is a really choice product. Still wines, either red or white, while quite as good as the average wines made from the Old World grape, are not nearly so good as the best still wines made in Europe.

Vinifera grapes contain much more sugar than do American species. Their sugar content may run as high as 30 per cent, while native grapes seldom have the 22 per cent of sugar necessary for making a good, sound wine.

While most people bred in eastern America like the grapes of

our region, those from other parts of the world, accustomed to varieties of *Vitis vinifera*, at first taste can hardly swallow eastern American grapes. They do not like the foxy odor and taste of the Labruscas, as Concord or Niagara; the tartness of the Vulpinas; the peculiar odor and taste of the Rotundifolias; nor the wild tang of the other native grapes. All foreigners object to the slip skins, which cannot be eaten and must be ejected; to the tough pulp, swallowed by those born to the custom as is the oyster; and to the numerous hard seeds so difficult to separate from the pulp that they are usually swallowed. Nor is there, as yet, the great variety of delicious flavors in American grapes that there is in the Old World varieties—especially of the aromatic odors and taste of the Muscats and Cabernets.

Then, of course, raisins, either the sugary dessert raisins, or the tart little corinth currants, cannot be made from native grapes. Neither in any pure-bred variety nor any hybrid are there sufficient solids, especially grape sugar, to permit the making of raisins.

The yield of the Old World vines is probably twice as great per vine as the yield of any American grape, if the yields of some wild Rotundifolias with their space-covering growth per vine of an eighth acre or thereabouts be excepted. The yields are greater because more bunches are borne, and the clusters and berries are much larger. The bunches of some varieties weigh as much as five pounds; though, on the other hand, those of some wine grapes, of which the bunches are usually small, may not weigh more than a few ounces.

The vines of *Vinifera* grapes grow well in a great variety of soils. One sees them growing in Europe in sandy, chalky, gravelly loams and clays, seemingly quite at home, in this variety or that, in any part of Europe where the climate is agreeable. This is also true of California, Argentina, Chile, Australia, New Zealand, and North and South Africa; though it is pretty well agreed that, in all these regions, when the grapes are grown for wine the vines should not be set on very fertile soils.

The *Vinifera* grapes are much more fastidious in respect to climate than to soil. On the one hand, they will not grow with-

out winter protection in a region where the thermometer goes down to zero; and on the other hand, they do not like, in many varieties at least, excessively hot nights and days, and fruit and foliage are scalded by a bright sun, as in our southern states. Nor do they like too much rain: they rather prefer a dryish climate. It must be said, however, that there are exceptions and qualifications to all these statements in regard to climate.

Truth is, it is impossible to set the limits of environment for this exceedingly cosmopolitan species. To the author, who has seen *Vinifera* vines in North America, South America, Europe, and North Africa, this seems to be one of the most versatile of all cultivated plants. In one region the varieties planted are small and feeble for the grape, the bunches and berries small—one knows at once they are grown only for the wine-press; in another region both vines and product are the very opposite. Some require five months to ripen their crops; others as long as seven. Some in fruit and foliage fall prey to every grape pest, insect, or fungi that comes along; others resist them to the bitter end.

All this is to indicate that there ought to be places in eastern America where a plant so variable can be grown. To be sure, trials have been numerous enough, and it would seem thorough enough to convince the most enthusiastic lover of grapes and wines that this species is not for the eastern states. But there are reasons why grape-growers may now succeed, even though those of one, two, or three centuries ago failed. We know now how to control the insects and fungi that attack the vine, which, almost alone, kept earlier grape-growers from growing *Vinifera* grapes. In particular, by grafting on resistant stocks, we can overcome the worst of all grape pests, phylloxera; and by spraying we can protect the vines against powdery-mildew, downy-mildew, and black-rot, diseases that were in the early days fatal to these grapes.

AN EXPERIMENT IN GROWING VINIFERA GRAPES AT GENEVA, NEW YORK

In the spring of 1902, cuttings of 14 varieties of *Vinifera* grapes were obtained for trial from the United States Department of

Agriculture by the New York Experiment Station. These were bench-grafted on resistant roots and set in the nursery. All but one were killed by cold the first winter, not having been well protected. In the autumn of the same year plants of 5 varieties of Vinifera were obtained from Dr. G. L. Tinker, New Philadelphia, Ohio, who was then growing a number of European grapes in the open quite successfully. All had been grafted on resistant stocks. This lot of varieties, two vines of each, grew so well that in 1910 a number of grafted vines were obtained from Washington. They came so late, however, and the weather was so unfavorable that most of them died. In 1911 a third lot of 71 varieties was obtained from Washington, and 30 more from the California Experiment Station were imported as cuttings. A real experiment now began.

At the time, a number of vigorous vines from six to ten years old were growing in a station vineyard. They were of miscellaneous origin but all were free from phylloxera and therefore suitable as resistant stocks—ideal for the experiment in hand so far as this insect is concerned, but rather too variable for a really good experiment. The grafting was a success, since out of 6 cuttings of each of the 101 varieties grafted on the old vines, 70 per cent grew and only 2 varieties were lost. The method used was that of grafting in the field, discussed on page 39 of this text.

PLANTING VINIFERAS IN EASTERN AMERICA

Those who would grow Vinifera grapes in eastern America will have their greatest difficulty in finding plants. To buy them ready to plant is the best way if possible; but no nurseryman in the East offers them for sale, and it is difficult to get from California or Europe the kinds and on the stocks wanted. One is almost forced to graft. Probably the best stocks are *Rupestris du Lot* and *Riparia Gloire*. Buy one-year-olds of these stocks from California, set them in the field, and graft them the next spring. Failing to get these standard stocks, try Clinton, which can be purchased from eastern nurserymen—probably it is as good as the stocks from California.

One plants Vinifera grapes in eastern America just as he does

native varieties, with this exception. Few Viniferas need quite as much room as is given the natives. In general, 6 by 6 feet is quite sufficient, but if these foreign sorts are in a vineyard with natives, then, of course, the distances should be the same for both. Another difference in planting is usually made. If the vines are set with the graft much below the surface of the ground, the cion is almost certain to take root and becomes a vine on its own roots, which is not desirable. The vines should be examined once or twice a year—say spring and midsummer—and cion roots, if any, should be removed.

WINTER PROTECTION OF VINIFERA GRAPES

As has been stated, Vinifera vines cannot stand a lower temperature than zero; or, perhaps, a good comparison to make is that they are a little less hardy than peaches or sweet cherries. In particular, young vines are tender to cold, and if they are not killed the first winter they fail to survive the second or third. To give protection seems like an insuperable obstacle to growing these grapes; but, after a winter or two of experimenting, it turns out to be a simple, cheap chore, and one, by the way, that will enable those who want to grow grapes, either Viniferas or native species, to do so as far north as the apple or sour cherry are grown.

The canes can be wrapped with straw, as is done with roses and other tender ornamentals, but it is cheaper and better to cover them with earth as follows:

As soon as there is danger of the ground freezing, the vines are pruned, cut from the wire and bent to the ground. Some care has to be exercised so that the trunk is not broken. While one man holds the vine down, another throws on dirt from each side till it is covered to a depth of five or six inches. During the winter this dirt will settle down considerably; sometimes part of the trunk will be uncovered, but usually there is no injury. This work can be done so rapidly that it adds but a few cents to the cost of growing the vines.

PRUNING VINIFERA GRAPES IN EASTERN AMERICA

Because of the necessity of bending the trunk to the ground for winter protection, provision should be made for replacing the trunk as soon as it becomes old and stiff. This can be done by leaving a replacing spur at the base of the trunk. If two-eye cions are used when the plants are grafted, and both buds grow, the shoot from the upper can be used to form the main trunk while that from the lower bud will supply the replacing spur. Each year all but one of the canes coming from this spur are removed and the remaining one is cut back to one or two buds until the main trunk begins to be too stiff to bend down readily; then one cane from the spur is left for a new trunk and another cane is pruned for a new renewal spur.

The main trunk is carried up only to the lower wire of the trellis. At the winter pruning, two one-year canes are selected to be tied along this wire, one on each side, and two renewal spurs are left as close to the top of the main trunk as possible. A year later, canes that grow from these renewal spurs are selected for tying up, and new renewal spurs are left. For the best production, different varieties require different lengths of fruit canes. In general, weak varieties are pruned heavily and strong ones lightly. Under normal conditions, from four to eight buds are left on each cane, depending on the variety and the vigor of the vine.

II. The Vintage

THE word *vintage* is used in several quite distinct ways in grape-growing and wine-making, to the great confusion of those interested in these arts. The subject cannot be discussed with clearness without defining the word in its several meanings.

The original meaning of the word was ‘the act of gathering grapes,’ presumably from *vint*, a verb, with the meaning ‘to take.’ A second meaning, now about as common as the first, is the ‘season of grape-gathering,’ the ‘vintage-time’ so often mentioned in all the books on grapes. Quite distinct from the definitions given is its use to designate the product of the *grape-harvest*, the especial reference to the annual yield in wine, as, the vintage of France in a certain year. Still another meaning, one of the commonest, is to indicate the finest wines of a good grape year, a *vintage wine* of this or that date: when the date of a vintage is given the wine is supposed to be especially good. As derivatives, there are: *vintager*, one gathering grapes; *vintaging*, the act of gathering grapes; *vinter*, one who sells wines; and *vintnery*, the trade of a vintner.

SEASON OF GRAPE-GATHERING

In the North Temperate Zone the vintage season is late September and early October. In a very few weeks of these two months, nearly all the grapes grown north of the equator are picked, stored, made into wine, or dried into raisins.

These few weeks of the vintage are the red letter days of grape-growing, the crisis that crowns the season’s labors. In Europe, the vintage is celebrated with songs, dancing, and much merriment—survivals of the ancient cult of Bacchus, the Greek god of

wine. In America, the grape harvest is of less importance, so far as its celebration is concerned; still, it is more picturesque than the harvesting of any other crop. It is work in which youth and old age, as well as those in the prime of life, of both sexes, take part, so that the vintage in America, as in Europe, is an occasion of some social activity. In America, however, we do not connect the vintage with wine-making, as it is in Europe, from which, of course, Julia Ward Howe drew her figure of speech: 'He is trampling out the vintage where the grapes of wrath are stored.'

A vintage year, so notable when it occurs in European countries, may be expected almost every year in America. Weather makes a vintage year. For an ideal grape harvest, there must be an autumn dry and warm enough so that the grapes are high in sugar content, and the flavor perfectly developed. There should be just rain enough to bring grape berries to full size without turgidity to cause cracking. In such a vintage, the sugar ferments into an abundance of alcohol to preserve the wine to a ripe old age, when it becomes rich, mellow, and velvety; and the flavor and aroma are characteristic of the variety and at their best.

It is vintage wines of such seasons in Europe that become legendary. The great Claretts, Burgundies, and Ports and their virtues are celebrated for a generation after bottling. Only home wineries can carry on the tradition of especially fine wines in certain years—commercial wine-makers are in much too great a hurry.

The vintage should never begin until the grapes are fully ripe. Often grapes are picked before they are ripe, to the great detriment of their flavor and to that of wines made from them. Grapes picked before they are ripe lack sugar; and the esters which give flavor are not developed until full maturity. Neither is the aroma, so essential to high quality in this fruit. Perhaps worst of all, grapes are much too acid before full maturity, especially in eastern America. If season and weather permit, it is often advantageous for wine-making to delay the vintage, that the juice may become more concentrated through the evaporation of excess water.

WHEN ARE GRAPES RIPE?

Many grapes acquire their typical color before they have reached full maturity. Color alone is not a good guide to harvesting time. To be sure, grapes are not ripe until they have their perfect color—black, red, golden, green, or whatever color. Ripeness is indicated by a combination of signs difficult to describe but easily learned by experience. Despite its unreliability taken alone, a characteristic color is the first sign noticed; the second, and perhaps the best guide, is the full development of flavor and aroma; third, the pulp of a ripe grape must have a soft texture and a slight thickening of the juice; fourth, the ends of the stems turn from green to brown; fifth, the berries pull more easily from their stems; and, sixth, the seeds are more nearly free from the pulp and usually turn brown.

An experienced grape-grower does not need to examine all the characteristics noted in the preceding paragraph to tell whether his grapes are ripe. These several signs he takes in at a glance and a taste and knows at once whether his crop is ready to harvest. In eastern America, grapes may be allowed to hang on the vine for some little time after maturity; the late suns give them a higher sugar content and a lower percentage of acids. Those who grow grapes for the home may run the risk of a light frost to secure perfect maturity and the advantage, slight to be sure, that a frost causes many leaves to drop, thus making picking easier.

Nearly every variety of grapes possesses two very distinct perfumes. One is an aromatic odor when the sun is hot upon them in the vineyard; the other is a musky odor which develops in the cool of storage. These two odors are, perhaps, most noticed in Niagara and Concord. Nothing so stirs the ghosts of long ago as remembered odors. The rich distinctive perfumes of a great number of grapes are precious to old vintners, no other perfumes of plants stirring up more pleasing youthful memories.

The odors of grapes are infinite. They not only vary with the species and the variety, but change with the weather, both with temperature and moisture. In a vineyard of several varieties of

grapes the odor of one usually predominates. That of most varieties of Labruscas, as Lutie, Lucile, and Wyoming, are as unpleasant as that of an ill-smelling bug; that of Niagara and Concord is disliked by some and liked by others; the odor of Delaware is as sweet and delicate as that of the sweetbriar rose; Dutchess, Iona, and Diana have the perfume of Rhenish wines.

GRAPE PICKING

Few appliances are needed in picking grapes. Shears are a necessity. Grapes ought not to be pulled from the vines but should be clipped with grape-shears, which may be purchased in any horticultural-supply house. The grapes are usually picked in wooden trays and taken to a storage house, whether wanted for table use or for wine. Trays may be of any desirable size, but are usually shallow flats holding 20 or 30 pounds. In a vineyard of an acre or more, growers usually have specially built one-horse platform wagons, the front wheels of which turn under the platform.

A dry, breezy, sunny day is best for picking grapes. If the weather is cool, so much the better. In hot, moist weather, the fruit may start fermentation before it reaches the storage place or the fermenting vat, and fruit flies are much more troublesome. Ripe grapes deteriorate rather rapidly after picking, and should not only be picked in good weather, but should be handled with reasonable care. In not one year out of ten is there a combination of a good season for grapes and perfect weather for picking.

PACKING, GRADING, AND STORING

The grape-grower who sells his crop must have a house for packing, grading, and storing. The man who has an acre or less can get along with a table in the woodshed to grade and pack, and a dry, cool cellar in which to store; or one room may serve all these purposes.

No matter how small the vineyard, it is very convenient to have a table built to hold the trays of grapes as they are brought in from the field while the fruit is being packed. These tables serve best if the trays can be set before the packer on an incline.

Empty baskets are stored on a higher shelf convenient for the packer. Sometimes the table is circular and revolves; the baskets are held on the lap, and the packer takes the grapes from the trays as the table is turned. The advantage of a circular table is that the packer can select from a larger quantity of fruit.

If the grapes are to be used for wine, a packing-room is hardly needed. If, however, the grapes for wine are to be stemmed, as most of them should be, a room or shed with tables for holding trays is a necessity for a home vineyard.

If one sells a part of his crop, the grapes must be graded, and it is a great satisfaction to have them graded when stored for home use. Grapes are graded into firsts and culls—a rather easier process than to grade any of the tree fruits. In the firsts, the bunches are uniform in size; missing berries in a bunch must be few; the grapes must be of the same color and degree of ripeness; and the fruit must be free from fungous and insect injuries. All grapes not firsts are culls. Culls are very often used to make wine, but poor grapes make poor wines. Slender scissors are used to cut out defective berries when grading. If the grapes stand overnight to wilt, grading is easier and better. In all these operations the fruit should be handled with care to preserve the bloom and keep the grapes clean and bright.

Packages for grapes are much the same in all grape regions in eastern America. If the grapes are sold, the package is always a gift to the purchaser. This receptacle should be bright, clean, and dainty, whether the fruit is to be sold or stored for home use.

The package used in eastern America, for all but *Rotundifolia* grapes, is the climax basket, so universally to be seen in markets and homes that it is called a 'grape-basket.' These baskets are cheap, easily packed and handled, durable, and nest well in storage. Three sizes are in common use, the 5 pound, 10 pound, and 20 pound. All three are a little short in weight when filled with grapes, but since package and contents are sold by the basket, the sale is not really cheating.

Grapes bought for wine usually come in 20-pound baskets if the vineyard is distant; in returnable trays, if grown near by.

Sometimes they come in bushel baskets, but these are not liked by wine-makers.

Baskets left in the sun or carried over winter become discolored and dingy. They may be bleached by fumigating with sulphur. Even when grapes are kept for home use, one likes a neat, bright package; to secure this the baskets should be stored in a clean, dry, dark room when they come from the maker.

In packing, each bunch of grapes is placed separately in concentric tiers in the basket. When the basket is filled, the grapes rise a little above the level, care being taken not to have them too high, or they will be crushed when the cover is put on.

Commercial grape-growers take great pride in their labels, which make the basket more attractive, give the name of the variety, and are a guarantee of the quality. Moreover, they are a good advertisement. Even when the grapes are grown for home use, a neat label, if it only specifies the variety, is worth while.

Cold storage, of course, is the best place to keep grapes either for the market or for home use, where cold storage is available, as it is in nearly all the grape regions of the country. Cold storage prolongs the grape season three or four months. A few years ago, one could buy or keep native grapes only until Thanksgiving or a little later; now they may be had until March, while grapes from California are on the market the year around. No preparation of the grapes is necessary before putting them in storage. It is poor business to store any but clean, sound, fully ripe, well-packed grapes.

Despite the convenience of storing in artificially cooled warehouses, growers of grapes for home use may want to keep their fruit at home in common storage. There are several grapes, happily the very best, that can be kept until midwinter if one is willing to take pains in storing. For example, Catawba, Diana, Iona, and Dutchess, four of the best native varieties, are all good keepers under proper conditions.

Old-time grape-growers had a way of keeping their grapes until midwinter. Here is the way they did it. The grapes were graded into trays holding 40 or 50 pounds. The temperature of the room

in which the grapes were placed was reduced gradually. If the weather was cool, the grapes were left out-of-doors the night of the day they were picked. Early the next morning they were put in the storeroom, whether cellar or house. This room was well ventilated, even in temperature, and without draughts which would cause the grapes to shrivel. Windows were opened at night and closed by day.

In modern home storage, the temperature should be kept about 50° F.; the storage-room must not be too dry or the grapes will shrivel; nor too moist or they will mold. A dirt floor helps to keep a happy medium between an atmosphere too dry and one too moist.

There is a supposition that grapes grown on clay soils keep better than those grown on sandy, gravelly, or stony soils. Some years ago there was an organization in Ohio called 'the Clay-growers' Association,' which advertised that its grapes were firmer and kept better.

HARVESTING ROTUNDIFOLIA GRAPES

The Rotundifolia grapes of the South Atlantic and Gulf states are so different in almost every respect—quite as distinct as the pear is from the apple or the plum from the peach—that harvesting and storing are done quite differently than with grapes from northern vineyards.

In the first place, most of these Rotundifolias are grown in arbors with the grapes hanging overhead. Jarring the grapes from the vines is the only practical way of harvesting the arbor-borne crop. The grapes on these vines of the far South, it is to be remembered, drop from the stems, the berry being the unit rather than the bunch.

In 1913, Husmann, in Bulletin 273 of the U.S.D.A., pages 33-36, described jarring Muscadine grapes as follows:

Polos are attached to sheets of canvas measuring 6 by 12 feet and having leather handles. A man is placed at each end of the sheets and four men with two sheets work together. The wide sides of the two sheets are brought close together under each vine,

with the trunk of the vine in the middle. The vines are then jarred, the berries falling into the sheets. Those not caught by the sheets or that have fallen to the ground by the shaking of the trellis when the fruit of the adjoining vines was harvested, etc., and which are usually of the best quality are picked by hand.

These Rotundifolia grapes are not grown now so often on arbors, and picking by hand is taking the place of jarring. The jarred grapes had to be cleaned at some expense to get rid of leaves and twigs, and even so the hand-picked fruit was more desirable. Rotundifolias seldom ripen at the same time so that there should be at least three pickings. In jarring, green and ripe grapes drop together.

Rotundifolias are cleaned, after jarring, by fanning machines; or, when the quantity is small, the debris is picked out by hand. After cleaning, the grapes are put in bushel baskets, crates, or barrels and taken to the market or winery. If the grapes are to be sent to distant markets, the three sizes of climax baskets used by vineyardists in the North are used.

12. Vineyard Miscellanies

THERE still remain several matters of more or less importance in grape culture not covered in the chapters that have gone before. The subjects are not closely related, nor are they of equal importance, or important enough for a separate chapter on any one of them, so that it seems best to throw them into a single chapter of miscellanies. The first of these to be discussed is cross-pollination.

CROSS-POLLINATION

As has been briefly mentioned on several preceding pages, some grapes are self-sterile and crop failures result. On the other hand, most varieties fruit perfectly without cross-pollination, being quite self-fertile. Some varieties fall between the two extremes, and are neither wholly self-sterile or self-fertile. Until the discovery of these differences in fertility were made, the uncertainty attending the setting of a crop was one of the chief discouragements in grape-growing.

The most frequent cause of infertility is the impotency of pollen on the pistils of the same variety. Again, with a few varieties there seems to be insufficient pollen. In some grapes the pistil does not become receptive until the pollen of the same flower has lost its vitality. And, again, the pollen in some varieties is defective.

The structure of the grape flower is a pretty safe guide whether the grape needs cross-pollination. Very short and recurved stamens are always associated with complete or nearly complete self-sterility. Nearly all grapes with long straight stamens are self-fertile. Whatever the cause, the remedy for self-sterility is inter-planting.

To inter-plant intelligently the grape-grower must be very certain of the self-fertility or degree of self-sterility of his varieties. Fortunately, no grape-breeder in recent years would think of introducing varieties that are even partially self-sterile. A good description of a variety will state whether or not it is wholly or partly self-sterile.

The grape-grower must have some knowledge of the time different varieties bloom. The blooming period for grapes at Geneva, New York, as established by records covering many years, is from 5 June to 25 June, the average length of the period being 20 days. Farther south the blooming period is earlier and a little longer. Most experiment stations in states where grapes are grown can give relative blooming dates of varieties and can tell what the best grape is to inter-plant with a self-sterile sort.

RINGING GRAPEVINES

Grape-growers who exhibit their wares at fairs or fruit exhibitions ring their vines to produce larger bunches and berries; as, of course, many people do also for their own satisfaction.

Ringing is simply and easily done. The operation consists in taking from the plant below the fruiting shoots a layer of bark through the cortex and bast. The width of the wound varies from a simple cut by knife or saw to taking a band of bark an inch or more wide. Ringing must be done when the bark peels most readily from the vine, usually when the grapes are about one-third full size.

One sees at once the reason for the effect of ringing. Raw sap passes from the roots of the vine to the leaves through the outer layer of the woody cylinder; in the leaves the sap is changed into available food, after which it is distributed to the several parts of the plant through vessels in the inner bark. Ringing does not hinder the upward flow, but the newly made food cannot pass from the leaves lower than the wound made by ringing; therefore the top of the plant is supplied with an extra amount of food and the bunches and berries grow much larger.

As might be expected, ringing is more or less harmful to the

vine, for the parts below the wound are deprived of food; when the bark is removed, the woody cylinder dries out somewhat, checking the upward flow of sap, whereby the plant's vitality is reduced. Then, of course, if the cut is even a little too deep the vine may be 'girdled,' an operation that usually kills it; yet ringing can be done without great injury to the vine, as has been often demonstrated.

In ringing, the method of training must always be taken into consideration. If, for example, the vines are trained in the two-arm Kniffin way, the ringing should be done on both arms just beyond the fifth buds, leaving ten buds on the arms to supply wood and foliage enough to keep the vine in vigorous condition. If the training is the four-arm Kniffin method, only the two top arms are ringed. Whatever the method of training, some unringed wood must be left on the vines to supply leafy shoots. It is best to ring every other vine each year, giving the alternate plants a chance to recover any loss of vigor that may have followed the operation.

Several other considerations are important: the vines should not be permitted to carry too large a crop; the amount of fruit on the ringed arms must depend on the amount of foliage on the arms and on the vines. If too much fruit is left on the ringed arms, the clusters are small and the grapes are inferior in quality. All the bunches between the rings and the trunk should be removed, for these grapes do not ripen well and become a drain on the vine's vitality.

Grape-growers who ring their vines agree that the practice has the following results: berries and bunches are larger; maturity is hastened; the quality is not quite so high in fruit from ringed vines, a fact especially true of such choice varieties as Delaware, Iona, Diana, and Dutches, and varieties in which the grapes crack badly, as Worden, suffer more from cracking on ringed vines.

The time to ring depends on the season and on the variety. As has been said, usually the time is approximately when the grapes are one-third grown. When only a few vines are to be ringed, the

work is easily done with a sharp knife; when a great number of vines are to be ringed, some simple tool such as those shown in Figure 31 may be used.

BAGGING GRAPES

In large or small vineyards, when especially fine grapes are wanted, it is profitable to cover the clusters with paper bags. Bagging serves several purposes, all at a small cost, chief of which is protection against birds, insects, fungi, sunscald, and frost.

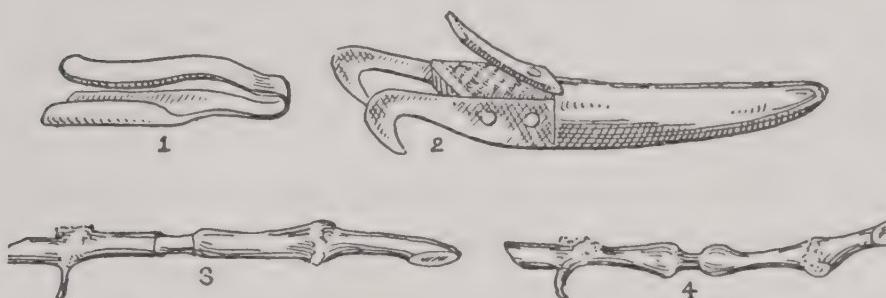


Fig. 31. Tools used in ringing grapevines are shown in 1 and 2; 3 and 4 show ringed vines at the beginning and the close of the season.

By and large, grapes east of the Rocky Mountains suffer nearly as much from birds as from insects and fungi. Probably robins and starlings do most damage, but many other birds, the country over, take heavy toll. Grapes with small berries, as Delaware, Clinton, Seibel hybrids, and similar sorts, suffer most. Varieties with tender pulp and those that shell readily are liked best by birds. Bagging is the only efficient way of preventing damage by birds. Varieties liked by birds usually suffer from bees, too, against which bagging furnishes full protection.

The ravages of all insects and fungi are more or less prevented by bagging, so that in home vineyards bagging often eliminates the necessity of spraying. Because of the warmth given by the bags, the ripening season is hastened, and damage from early frosts may be prevented. Grapes covered by bags are more attractive in appearance than those left exposed to the weather, having a fresher, brighter look and more of the attractive bloom.

If the fruit is to be protected against insects and fungi, the sooner the bags are put on after the berries are formed the better; of course, the clusters should never be covered in the blossoming stage. The common $1\frac{1}{2}$ - or a 2-pound Manila bag used by grocers is just as satisfactory as any of several patented bags on the market. In using the grocer's bag, the corners of both the top and the bottom are cut off by placing several bags on a firm level surface and using a broad chisel. Cutting off the corners makes it possible to close the bag neatly over the cluster and lets water run out the holes at the lower corners. The top is pinned above the lateral from which the bunch hangs, and must not be fastened about the stem of the cluster, as then bag and cluster may be carried away by the wind. The largest pins to be purchased in dry-goods stores are used.

The cost of bagging, for bags and labor, is about \$2 per thousand bags. Women do the work rather better and more quickly than men.

SEEDLESSNESS IN GRAPES

Seedlessness is a rather common phenomenon in all cultivated grapes and occasionally occurs in wild vines. There are three main types of seedless grapes. One is entirely seedless, as are Corinth grapes. Another is represented by the Sultanina, commonly grown in California, and Stout's Seedless in eastern America, of which the fruits may contain one or more abortive seeds. In the third type, quite commonly found in all cultivated grapes and occasionally in wild ones, a few berries in bunches are seedless or nearly so, chiefly because of lack of cross-pollination.

Corinth grapes are grown for the most part only in the Levant, where their exportation to all parts of the world is a great industry. They come, as everyone knows, to our markets as dried currants, a small raisin much used in cookery. The name comes from Corinth, the city in Greece. The name of our common currants, a species of *Ribes*, comes from the resemblance to this little raisin.

Grapes of the Sultanina type are nearly, but not quite, seedless; if the fruits were a little larger and the vines a little more pro-

ductive, these would be the delight of growers of grapes for both the table and wine. Those who eat grapes out of hand would be glad to be rid of the troublesome seeds, and the wine-maker would like these grapes because if too many seeds are crushed in pressing, the must has a bitter taste. No one knows how many grapes of this type are grown in the world, but there are certainly a good many, several of which are much grown in California. Dr. A. B. Stout of the New York Botanical Gardens, working at the Geneva Experiment Station, has produced a hundred or more seedless grapes by crossing seeded varieties with seedless ones. Three of these, described in this text, are grown in vineyards. Now and then seedless grapes appear as seedlings and as bud sports. Concord Seedless and Hubbard Seedless probably originated as bud sports.

The two types of seedless grapes discussed are all to the good, but the third one is not to be desired. Very often poorly filled bunches of berries appear in vineyards in which there are small, soft, seedless grapes. These are most common in varieties where cross-pollination is necessary for the formation of fruit, or where for some reason the pistils were not pollinated.

This whole matter of seedlessness in grapes is well discussed by Dr. A. B. Stout in Bulletin 238 by the New York Agricultural Experiment Station at Geneva.

SPLITTING OF BERRIES

One of the minor ills of grapes is the splitting of fruits. In nearly all varieties there is an occasional split specimen. The ever-present fungi, often of several kinds, find the wound a good breeding place and rots and molds soon follow. Bees and birds are attracted by the sweet sap and begin depredations.

The causes are not far to seek. There has been a rapid growth because of a too-rich soil or an excess of heat or moisture, and the cells at the circumference of the grape become so turgid with sap that the skins burst. Or, in normal growth, a check from cold or drouth stops the increase of cells, and when growth again be-

gins the skins burst because of the turgidity of the underlying tissues.

Nothing can be done to stop splitting once it begins. Something, though little, may be done to regulate conditions before splitting occurs, especially in varieties quite subject to the trouble. In all varieties in which the berries split badly, prune sparingly and so permit almost unrestricted growth of leaf and wood as an outlet of the vine's energy. If the bunches are thinned, splitting is usually more common than in unthinned vines.

VINEYARD LABELS

A good label is an essential in any collector's vineyard or in a home vineyard where there are a half dozen or more varieties. The label should record not only the names of varieties, but, if possible, the date of planting. How often one finds a vineyard in which there are varieties that cannot be identified because planting records and labels were not made! A good label should be cheap, easily made, and as nearly indestructible as possible by weather, sprays, and usage.

Wood is the most common material for labels. A white pine label soaked in a rot preventative, such as tar or creosote, and painted with white lead paint is as cheap and durable as any. The lettering is best done with a camel's-hair brush in black on the white.

The label most used on experiment station grounds is made of an aluminum ribbon. This is the most satisfactory label yet invented. The labels, whether wood or aluminum, should be nailed on the vineyard posts. They should, of course, be horizontal so that the head need not be cocked to read them—a trying inconvenience.

13. Grape-breeding

Most grape-growers live and die without knowing how, when, where, and with whom the varieties in their vineyards originated. And, in these days of experiment stations, they are content to let state-paid experimenters breed and test new varieties; this is quite as it should be, for, as will be seen, grape-breeding is slow, costly work, in which only government workers, state or national, can accomplish much. Nevertheless, every grape-grower ought to know something about the history of the varieties he is growing, and a few may want to make grape-breeding a hobby. In the chapter on varieties is told where, when, and by whom the grapes described were originated, and from what species they were derived. This chapter is to be devoted to a brief history of grape-breeding in America, and a rather full account of the processes by which new varieties are bred.

A good many of our varieties of grapes came by chance—the hand of man had only to bring them from the wild and plant them in a garden. No variety of the cultivated species of American grapes was planted in a vineyard until someone found a wild grape of surpassing quality of fruit that was thought worth cultivating. Thus was found, first of all, the Scuppernong from *Vitis rotundifolia*; then Catawba, from *V. Labrusca*; Norton, from *V. aestivalis*; Delaware, from *V. aestivalis Bourquiniana*; and Clinton, from *V. vulpina*. After more than a century none of these grapes is excelled by newer sorts of their blood. Still, we should not have gone far in cultivating American grapes, without grape hybrids.

GRAPE HYBRIDS AND HYBRIDIZERS

In 1806 M'Mahon in his *American Gardener's Calendar*, pages 226-241, devotes a chapter to the vineyard in which he describes 55 varieties of European grapes and mentions 4 species of native grapes. Then follows the statement: 'There are several varieties produced by the intermixture of the above, with one another, or with varieties of the *Vitis vinifera*, which are called hybrids or mules; the most noted, as (1) Alexander's or Tasker's grape; (2) Bland's grape; and that called the Raccoon grape.'

This is the first mention of hybridization as a means of improving the grape. M'Mahon advocated hybridization as the best method of getting good grapes. Thus he was the first American to mention a method which a generation later became the means of breeding all new varieties.

In 1822, Nuttal, one of America's most noted botanists, then at Harvard, recommended 'hybrids betwixt the European vine and those of the United States which would better answer the variable climates of North America.' Despite the wise advice of M'Mahon and Nuttal, no one seems to have made sure that he had bred a hybrid grape until 1852 when Dr. William Valk, Flushing, Long Island, showed bunches of a hybrid grape he had grown.

Dr. Valk had fertilized flowers of Black Hamburg, the magnificent Vinifera grape, then and now a favorite for greenhouse culture, with pollen of Isabella, at that time the favorite American grape for the North. The cross was made and the seed were sown in 1845. The seedlings bore a good crop in 1851 and Valk named one of them 'Ada.' This new grape was shown in 1852. A. J. Downing, the first really great American horticulturist, had to say of the Ada, in his *Horticulturist* in 1851 (page 245): 'There can be no doubt that this is the first genuine cross between the foreign grapes and our natives.'

Meanwhile, in 1830, William Robert Prince, the indefatigable horticulturist of Flushing, Long Island, author of the first good book on grapes, *Treatise on the Vine*, grew 10,000 seedling grapes 'from admixture under every variety of circumstance.' This was the

first attempt to improve our American grapes by hybridization, for, though the grapes do not appear to have been hybridized by hand, as was Valk's Ada, Prince knew that seeds from grapes in a mixed plantation were mostly hybrids. Nothing came from Prince's experiment, or from Valk's Ada, except to start hybridizers to work in all parts of the country where grapes were grown.

So much interest was shown in Valk's hybrid that a score or more enthusiastic grape-growers began breeding grapes by hand hybridization, dozens of new sorts being introduced year after year until the end of the century.

The first man to introduce a really good hybrid grape was John Fisk Allen, Salem, Massachusetts. He hybridized Golden Chasselas and Isabella, one of the seedlings of which he called Allen's Hybrid, a grape grown commonly in the Northeast for many years.

The most notable breeder of American grapes was E. S. Rogers, Salem, Massachusetts (a neighbor of Allen), who, in 1851, fertilized the flowers of Carter, an American grape, with pollen of Golden Chasselas and produced a number of seedlings, of which 45 were named. Collectively these were known as 'Rogers' Hybrids.' Of the 45, 13 became well known in all the grape regions of eastern America and vines of all may still be found in old vineyards. These were Goethe, Massasoit, Wilder, Lindley, Gaertner, Agawam, Merrimac, Requa, Aminia, Essex, Barry, Herbert, and Salem. All were favorite sorts fifty years ago, but the author does not consider any of them now worth growing for the table or wine, though several are better table grapes than Concord or Niagara, common varieties liked by the American public.

In the history of breeding fruits and vegetables, no other man has had so good luck with one lot of seedlings. The same cross made by Rogers and many others has not produced a single grape worth naming. A hundred or more men sought to make another such find with the result that in the next 50 years 2,000 new American grapes were introduced, about 1,500 of which the author has described in his *Grapes of New York*.

At no other time in America has grape-growing, or the culture of any other fruit, been so keen as in the three or four decades

following the introduction of Rogers' Hybrids. Every lover of fruits planted grapes—all were epicures of grapes and wines. Greenhouses were built to hasten propagation. Propagators of grapes made fortunes. One old nurseryman told the author that he at one trip to the express office carried over a thousand dollars' worth of rooted grape cuttings on his back. (It is significant of the times that the cuttings were of Iona and Diana, which grape-growers of those days were willing to take the trouble to grow.)

These early hybridizers were trying to get European bunches of grapes on American vines. As has been pointed out in another chapter, European grapes, cultivated and improved for several thousands of years, have many characters very superior to those of American grapes.

Because of this superiority of European grapes to American varieties, American hybridizers have ever sought for more and more European characters in new grapes. Many more than half of the 2,000 grapes introduced by eastern grape-growers are partly European. Yet few of these hybrids have great value. It seems that the vine characters of European grapes are so firmly established that they nearly always appear in primary hybrids with American species, and the weaknesses which prevent the cultivation of European grapes in eastern America crop out. Hybrids in which the *Vinifera* blood is more attenuated, as in secondary and tertiary crosses, give better results.

Several early secondary hybrids were long considered the best American grapes, of which Brighton and Diamond as representatives, are still grown. Brighton was the first of the secondary hybrids to attract attention and was introduced in 1870 by Jacob Moore, Brighton, New York, a breeder of many new grapes. For forty-odd years the New York Experiment Station has been breeding these secondary and tertiary hybrids, several of which are described in the chapter on varieties.

Jacob Rommel, Morrison, Missouri, was the first man to hybridize American species freely. He began breeding grapes in 1860 and hybridized *Labrusca* and *Vulpina* grapes so successfully that some of his varieties, particularly *Elvira*, *Montefiore*, and *Etta*, are

still grown. A fellow worker, Nicholas Grein, Hermann, Missouri, made similar crosses and produced Grein Golden, and Missouri Riesling, among a score of others, which are still grown.

But of the many hybridizers of American species, T. V. Munson, Denison, Texas, leads all. He made every combination of American species possible, fruited thousands of seedlings, from which came many good varieties, especially for the South and Southwest, not a few of which are mentioned in this text. During his mature years, say from 1880 to 1910, he was recognized in America and Europe as the leading breeder of American grapes and the chief authority on their botany.

Another breeder of note was George W. Campbell, who, in 1849, moved to Delaware, Ohio, and began breeding domesticated plants, eventually specializing in grapes. Of the many varieties he named, Campbell Early, Triumph, and Lady are still grown. Triumph, as has been said in describing it in the chapter on varieties, is, perhaps, the handsomest and best-flavored of all American grapes.

Beginning about 1900, the New York Experiment Station began hybridizing grapes. Between 1900 and 1943 perhaps as many as 200,000 seeds of grapes, nearly all hybridized by hand, have been planted, of which there are records of more than 25,000 that have borne fruit; of these 48 have been named, of which descriptions of 25 are given in this text. Usually, 20 or 30 years pass before nurserymen and grape-growers give new grapes, or new fruits of any kind, recognition.

SELF-POLLINATION AND MUTATIONS IN BREEDING

So far as is known, grapes grown from self-pollinated varieties of any species have never given a good new variety. Thousands of such seedlings have been grown at one place or another in America with much the same result. Selection, continued through several generations, so important in the improvement of herbaceous plants, is too slow a process with the grape.

Sports and mutations are found rather frequently in grapes, but out of the many varieties grown in vineyards not more than two

or three are known to be mutations. Mutations are so easily confused with variations arising from environment that it is not easy to say if a change in fruit or vine is a sport or not. Now that marked changes are being brought about by the use of chemicals in plants of all kinds, it is possible that grapes may be improved by changing with a chemical the chromosome content of grapes—possible but doubtful.

How to HYBRIDIZE

In these days no individual, unless he is a millionaire, can compete with experiment stations in breeding grapes, but any grower of this fruit can make a pleasing specialty of hybridizing. Any grape enthusiast might well, to give only a few examples, try to improve Iona, Diana, or Dutchesse for a white wine; Norton, Eu-melan, or Ives for a red wine. Or, if he is unfortunate enough not to have a taste for good wines, he might try to improve the glorious Triumph, best of all American table grapes; or, he could try his hand at hybridizing to obtain a seedless grape.

To hybridize grapes is a simple and easy task, if one understands the principles of hybridizing.

The first step in hybridization is to remove the anthers before the flower opens, a process known as *emasculat*ion, necessary to prevent self-pollination. It is best to emasculate just before the flowers open, making certain that pollen has not fallen from the anthers. Each one of the clusters of grape flowers having been emasculated, the cluster must be tied in a bag to protect it from foreign pollen; which, otherwise, would be dusted on the stigma by any one of a score of insects that hover about grape flowers.

Emasculation is simple but must be done with care. The anther and stigma of the flower of the grape are covered by a snug-fitting cap. In some grapes this must be removed before the anther can be reached. Often cap and anthers may be removed at a single stroke. The best tool is a small pair of forceps. In working with American grapes the blades of the forceps should have a sharp cutting surface, but with European grapes, where the cap must be removed to get at the anther, the blades may have a flat surface.

There is some danger that in mature buds pollen may be squeezed out on the viscid stigma; or that it may adhere to the forceps and fertilize future crosses. The first danger is avoided by the skill of the operator; to avoid the second, sterilize the forceps in alcohol after each cross.

As soon as the stigma is ready to receive pollen, the bag is removed and pollen from the male flower is put on, after which the bag is again tied over the flower cluster to remain until the grapes are set. By taking a look at uncovered flowers on the same vine, one can tell whether the stigmas are ready for pollen. The time to wait after covering depends, of course, on the age of the bud when emasculation takes place. A stigma is ready for pollen when it shows a tiny drop of viscous juice on its open surface.

Flowers from which pollen is to be taken must be protected from insects. This is accomplished by tying them in bags, just as was done with those to be pollinated. Pollen is taken from ripe anthers by crushing them, after which the small yellow grains may be put on the stigmas with a brush or scalpel. A brush is wasteful of pollen and often becomes a source of contamination to future crosses; a scalpel is a better instrument. When pollen is plentiful the best method is to take the cluster from the male vine and apply the pollen directly to the stigmas of the female vine, thereby making certain of fresh pollen and plenty of it. Grape pollen does not keep well and the fresher the better. Pollination is best done in bright, sunny weather when the pollen is dry and the stigmas very viscous.

There are a few more helpful hints, though the multiplication of them makes the operation of crossing seem complicated—really it is as simple as setting plants, grafting, pruning, or any other vineyard operation. A pair of forceps is the only required tool, although a hand lens is often helpful. Bags for covering flowers should be just large enough. Ordinary Manila bags will do but transparent ones through which one can see are better. The cluster of hybridized grapes should be covered with the original bag or a slightly larger one when the grapes have set to protect them

against birds and bees. While the bags are still flat, a hole is made near the opening through which a string is passed to tie the upper end about the cluster.

THE INFLUENCE OF PARENTS

There is so much difference in the offspring of varieties that much depends on the selection of parents in hybridizing. Find out from some text in which the histories of varieties are given what parents of cultivated grapes have been most used by breeders—Rogers, Underhill, Ricketts, Rommel, Moore, and Munson, to name but a few—and use these well-tested starting points. Find out, also, what parents the different breeders in experiment stations are now using. There is no way of discovering what the best progenitors may be except by records of performance.

Do not make the mistake of taking it for granted that varieties of high cultural value are likely to make the best parents in hybridization. Concord, Niagara, and Catawba, leading cultivated grapes in eastern America, have given a very small percentage of good offspring in grape breeding; on the other hand Delaware is one of the best of all parents. Several varieties of much lesser value in the vineyard, as Mills and Ontario, have been parents of many choice grapes.

NEW CHARACTERS IN GRAPES

Do not expect that by hybridizing you may obtain totally new characters in grapes. It is almost certain that new characters are never introduced in plant life by hybridizing. A new variety originating from hybridization is but a recombination of the characters of the immediate or distant parents; the combination is new but the characters are not. Intermediate forms rarely or never occur. One parent in hybridization may contribute most of the fruit characters; as color, flavor, texture of the grape and size and form of bunch; the other parent may contribute vigor, hardiness, resistance to disease and the characters of leaf and vine; or, of course, the characters of fruit and vine may be intermingled in any mathematical way possible. It remains for anyone attempting to breed

grapes to make sure that the parents chosen, or their ancestors, possess the particular characters wanted in the new variety.

The characters of grapes, in common with those of other plants, are inherited in accordance with Mendel's laws. The early workers in improving grapes knew nothing of these laws and were bewildered by the number of things that happened. Mendel's discoveries give some assurance of what averages may be expected when one plants hybrid seed. A knowledge of his laws is helpful to anyone in the hybridization of plants, but perhaps it is well to say that not too much can be determined from Mendel's laws in growing plants that have so few generations in a man's lifetime as the grape. Bulletins published by the New York Experiment Station, at Geneva, and the North Carolina station, at Raleigh, give information on the inheritance of characters in certain grapes.

The breeder of any plant makes progress only by growing large numbers of seedlings. He should use as parents all varieties that show promise of transmitting the characters he wants in his new variety. Weak seedlings should be discarded the first year, and a second discard may be made when the seedlings are set in the vineyard. There are very plain signs in the seedlings to show which should be discarded. If the leaves are few in number or if they are small, discard; if the internodes are excessively long, discard; if the internodes are very short and very stout, discard; if the canes are very slender, discard. After a few years' experience in growing seedlings an amateur will know which are fit for the vineyard.

NEED OF NEW VARIETIES

No grape is perfect and none ever will be. There will always be new combinations of characters needed to suit new soils, new climates, and for new purposes. Tastes are changeable and the varieties most popular in one generation may not be liked in the next. Nothing in organic life is permanent, nothing is fixed; and so, however well we may like varieties of the present, we may be sure that in time new ones will take their places.

What joy in the discovery of a new grape! Nature ran riot in fashioning varieties. Some six or seven thousand sorts, the world

over, each shaped, colored, perfumed, and flavored differently; all with cane and foliage in a common mold but each with differences in vine and foliage, which any sharp-eyed grape-grower can detect. To come upon a grape of real worth in a vineyard of seedlings, to give it a name, to introduce it to fellows of the craft of grape-growing, letting its origin remain a secret to a thousand passers-by, is to enjoy thoroughly breeding grapes.

In the *Grapes of New York*, published by the New York Agricultural Experiment Station in 1908, 1,500 varieties are described. The parentage of 1,168 of these is given, of which 402 are pure-breds and 766 are hybrids between American species, or American species and the Old World grape. Since this count was made in 1908, many more varieties have been named. The fruits of each of these varieties can be distinguished by the size of the bunch or berry, by the season, by some difference in foliage or stems; and, more particularly, by the size, shape, color, flavor, and aroma of the individual grapes; each of the many varieties has distinct differences in adaptations to climates and soils.

It would seem that these 1,500 varieties would furnish grapes for every agricultural region of America and for every possible purpose; yet this is far from the case. Not one of this great number is perfect; every variety is more easily described by its undesirable than by its desirable qualities. In the hundred years since the domestication of American grapes has been under way, grape breeders have but discovered the good starting points. With so many New World species from which to select and hybridize; and with far better knowledge of plant breeding, in the next hundred years North America should produce a cultivated grape flora as well fitted to produce good table and wine grapes as that now found in the vineyards of the Old World, where but a single species has been domesticated.

14. Varieties of Grapes

ONE might find mentioned in books on grapes, written in several languages and for the grape-growing regions of the world, as many as six or seven thousand varieties of this fruit. More than two thousand kinds of grapes are described in the eighty-odd books published in America since 1800. One might buy from nurserymen, if he were following the pleasant diversion of growing a collection of grapes, from one to two hundred varieties; this number might be doubled, or even trebled, if cuttings were obtained from experiment stations and other collectors.

The author is including in this text only varieties that can be purchased from nurserymen, and not all of these, since dealers list many kinds no longer worth planting. The varieties described in this chapter are divided into two groups: (1) Grapes for eastern America, most of which are hybrids between native species and *Vitis vinifera*; or, hybrids between American species. (2) Varieties of Vinifera grapes for eastern America. All the grapes put in this second group can be grown in California, but not all are; and a very great number of Viniferas not described in this text are grown in home vineyards on the Pacific Coast. The author is not competent to make a selection for the Far West, nor to describe the many varieties listed by nurserymen in California, whose catalogues should be consulted.

GRAPES FOR EASTERN AMERICA

America is a grape with many good qualities, yet it is nowhere largely grown. It is resistant to heat, cold, drouth, insects, and fungi. The clusters are large, but the berries are small; they are

purplish black, with purplish-red pigment. The grapes wholly lack the foxy taste of Labrusca but do have a little post-oak flavor. They make a very good wine, the sugar and acid content being about right. It is a good stock upon which to graft Viniferas to resist phylloxera. The chief fault of America is that it is self-sterile. America is a Munson hybrid and contains blood of Lincecumii and Rupestris.

Athens is a promising black grape of the Concord type, ripening a month earlier. Vine very vigorous, hardy, and very productive; bunches medium to large, loose, and tapering; berries larger than the Concord, roundish oval, black with a heavy bloom; flesh tough, sweet, slightly foxy, good quality. Well worthy of trial as an early black grape of the Concord type. Originated on the grounds of the New York Experiment Station at Geneva.

Bacchus is a seedling of Clinton which it surpasses in quality of fruit and in productiveness, but it is not so generally grown because it does not withstand so well drouth or grow so well in dry soils. It ripens with Concord but colors long before. When fully mature, acid and sugar content are about right for a red wine, which, brilliant in color, at first is harsh and sour but improves with age. The wine is good for blending with milder red wines. It is in most characters a Vulpina but shows some Labrusca blood.

Beacon is another of T. V. Munson's hybrids having Lincecumii and Labrusca blood. It is not hardy in the North but grows very well in parts of the South. The vine is very vigorous and bears a handsome, compact mass of foliage, which it retains well through heat and drouth. It ripens in mid-season and the grapes keep well. The clusters are large.

Berckmans is a cross between Clinton and Delaware in which we have very nearly the hardy vine of the former and the delicious fruit of the latter. The bunches and berries are a little larger than those of Delaware but not quite so good in quality; it ripens with Delaware. Vines and fruits are not so subject to fungi as those of Delaware. The great drawback to Berckmans is that it positively refuses to grow well in some soils, whereas Delaware is one of the cosmopolites of American grapes. The name commemorates

the viticultural labors of P. J. Berckmans, the great Southern horticulturist.

Beta came from Minnesota some years ago, and is one of the few grapes that can be grown in the far north of the Plains States. It is a pure Vulpina with all the characters of the parent species, such as hardiness, fruitfulness, and freedom from pests, but cannot be called a grape of good quality to eat out of hand. Its season is early. The berries are small, black, high in sugar and very acid. When well aged, the red wine is fair; blended with a wine less acid it may be good.

Brilliant is a cross between Lindley and Delaware. The clusters and berries are larger than those of Delaware, but the flavor is not quite so good, chiefly because of astringency in the skin; it ripens at the same time. The grapes do not crack or shell and may hang on the vines for a fortnight after ripening. Four defects have kept *Brilliant* from becoming a favorite in Eastern vineyards: fickleness about soils; unproductiveness; susceptibility to fungi; and unevenness in ripening. *Brilliant* is another of Munson's good varieties.

Brocton is a large-clustered, large-berried grape; the flesh is melting, separates readily from the seeds, and is sweet, richly and delicately flavored; bunches large. The vine is rather slow in growth, and is inclined to bear too heavily, for which reasons it should have special care in culture and pruning. *Brocton* should make a good white wine; it originated at the New York Experiment Station, Geneva.

Bronx Seedless is a large-clustered, large-berried grape obtained from a cross between a seedling and *Sultanina*, a seedless variety grown in California. The berries are oval, light red, melting, juicy and good in quality. During wet seasons the skin is liable to crack. The seeds are soft and pulpy and are eaten with the flesh. Another grape from the New York Station at Geneva.

Buffalo is an early black grape ripening in the first week in September, and is suitable for either dessert or wine. The vine is vigorous, slightly tender, and very productive; clusters medium in size, tapering, medium compact. The berries are medium, roundish oval, adherence strong; flesh juicy, melting, very sweet, slightly

foxy, pleasing, good. Still a third promising grape from Geneva.

Catawba (Plate xi) has long been the grape of grapes for white wines and Champagnes and a favorite for dessert as well. The grapes keep longer than those of any other American variety. The vine is vigorous and productive but hardy only where the peach can be grown. The chief faults of Catawba are that it thrives on few soils, and is susceptible to several fungi. The grapes are large, red, sugary, deliciously flavored, and can be kept in a cool dry place until Christmas. The juice is colorless and makes about the best white dry wine, and a splendid sweet wine as well. No grape-grower must forget that the growing of American grapes became popular with the introduction of Catawba by John Adlum in 1823.

Clevener was once popular and is still grown in a small way in New Jersey and New York to make a red wine. It is a blue hybrid between *Vulpina* and *Labrusca*. The vine is vigorous, hardy, productive, and thrives on all grape soils, characters which make it excellent on which to graft sorts that do not thrive on their own roots. A grave fault of Clevener is that it is self-sterile and must be planted with some other variety. It is late in ripening and the fruits keep well. The red wine, good when aged, should be blended with a milder wine—with that of Ives for example.

Clinton (Plate xii) has many good qualities, such as vigor, hardiness, productiveness, and immunity to phylloxera. Its defects are that the fruits are so small and sour that they are fit only for wine, though when touched with a light frost they are good to eat out of hand, and are excellent for all culinary purposes. The wine is raw and harsh until aged or blended with a milder wine. Clinton is one of the best stocks upon which to graft Iona, Diana, Dutchess, and other weak-growing grapes—even Concord is more productive on Clinton roots. It is one of the parents of many good grapes, and is much used by grape breeders.

Concord (Plate xiii) is the most widely grown of all American grapes. With its offspring it furnishes 75 per cent of the grapes of eastern America. Its most meritorious character is that it can be profitably grown in any grape-growing soil or climate in North America; again, Concord bears well year in and year out; it is

hardy; withstands fungi and insects; is comparatively early and so ripens in northern regions; the bunches and berries are handsome; the blossoms appear late, so that frosts seldom injure them; and the crop hangs well on the vine.

Concord has many faults: The quality is not high; the flesh lacks richness and delicacy of flavor; the seeds and skins must be ejected from the mouth and are thus objectionable; the grapes do not keep well; the foxy taste and aroma are not agreeable; the berries do not hang well to the stems; and the vine is but slightly resistant to phylloxera; it ripens too early in the South; it does not make a palatable dry or a very good sweet wine. The chief object in itemizing these faults is to show in what respects improvements can be made. Concord is probably a pure Labrusca, though some suspect it to be a hybrid with Vinifera. It originated with Ephraim W. Bull, Concord, Massachusetts, and was introduced in 1849.

Cynthiana is so like the better known Norton that it needs no description. The two fruits ripen a few days apart and are a little different in flavor. Like Norton, it is a splendid grape in the South for a dry or sweet red wine. It is hardly worth trying to grow north of Maryland.

Delaware (Plate XIV) is the standard, wherever American grapes are grown, to gauge the quality of other native grapes. It withstands climates in North or South to which most other varieties succumb; it is adapted to most grape soils and year in and year out bears abundant crops; the crop matures early enough to make it certain; the grapes in bunch and berry are handsome, nearly immune to black-rot, and keep well. Delaware is by far the best American white wine grape, though the wine until aged is a little acid. These qualities make it the most popular grape, after Concord, for garden or vineyard.

The faults of Delaware are that the vines are small, of slow growth, and the berries are small and susceptible to mildew, as is the foliage.

The vines should be planted closer together than most other grapes, should be pruned closely, and the crop should be thinned. It needs a well-drained, warm soil, good cultivation, and the vines

should be trained according to the Keuka method. The vine is, by the way, one of the most ornamental of all grapes, eminently fitted for arbors, fences, or as a house vine. The variety was long grown about Frenchtown, New Jersey, whence it was taken to Delaware, Ohio, in 1849 and from there distributed to fruit-growers.

Diamond is of surpassing quality and beauty of bunch and berry, and the vine is hardy and productive. It is an early grape and can be grown in as great a range of latitude as Concord. The variety has a very serious fault—its vines in many soils are subject to a yellowing of the foliage, which eventually spells death. Diamond is much used by wine-makers for white wines and Champagnes. Jacob Moore, breeder of several good grapes, grew Diamond, about 1870, from Concord fertilized by Iona.

Diana (Plate xv) is a seedling of Catawba to which the fruit bears strong resemblance, differing chiefly in having a lighter color, in being less pulpy, more juicy, and in having a less wild taste. The great point of superiority of Diana is that it is ten days earlier than Catawba, so that it can be grown far to the north. But Diana has so many faults that it is a less valuable variety than Catawba. The vine is tender to cold; the grapes ripen unevenly; the berries and foliage are susceptible to fungi; and the vine is a shy bearer. Diana grows best on poor, dry, gravelly, warm soils. On rich clays or loams the vines make a rank growth, and the crop is light and poor in quality. The vines should be pruned long and the crop thinned to grow the best grapes. Iona, Dutchess, and Diana are three of the best grapes for white wines, and the epicure will do well to specialize on one or all of these three.

Dunkirk was introduced by the New York Agricultural Experiment Station at Geneva in 1920 to take the place of Delaware. The grapes are of the Delaware color and flavor but the bunches and berries are larger; the bunches are more uniform and better filled; the vines larger and more productive, and as hardy and healthy. It remains to be seen whether it is as well suited to grape soils as Delaware, and also, whether it will make as good a white wine—presumably it will.



PLATE XI. Catawba



PLATE XII. Clinton



PLATE XIII. Concord



PLATE XIV. Delaware



PLATE XV. Diana



PLATE XVI. Dutchess



PLATE XVII. *Fredonia*



PLATE XVIII. Golden Muscat

Dutchess (Plate xvi) is the easiest to grow and the most productive of the three white wine grapes *par excellence*. There are few American grapes more distinctive in flavor or of higher quality. The grapes are of but medium size but are most handsome on the vine or in the basket when full maturity is reached. They are of a beautiful amber color, sprinkled with dots; the flesh is translucent, sparkling, fine-grained, and tender, separating readily from the few small seeds; the skin is thin, yet tough enough for long keeping; and the bunches are large and compact, especially fine when bagged, since the berries crack at maturity unless quickly picked. The great defect of Dutchess is that the vines are not very vigorous and thrive on few grape soils. A. J. Caywood, Marlboro, New York, breeder of many good grapes, grew Dutchess from seed of a white Concord seedling fertilized by pollen from Delaware.

Eden (*Labrusca* x *Vinifera*) is very promising because of its high quality, its earliness, and its good keeping qualities. It is a cross between Ontario and a seedling (*Triumph* x *Mills*), ripening in the middle of September. The vine is slightly tender, vigorous, and productive; the clusters are medium in size, cylindrical, small shouldered, and fairly compact; the berries are above medium, roundish oval, black; the flesh is juicy, slightly meaty, tender, sweet, vinous, good. Recommended for table and wine.

Elvira was at one time by far the most popular grape for white wines in the vineyard regions of Missouri. It is still much grown there, as it is in the Keuka grape region of New York. The vines are very productive; the crop ripens early, coming with that of Concord in New York; and the vines are almost free from fungous diseases. Two defects must be noted: the skins crack easily at maturity; and the flavor is not good enough to make it a table grape. As a wine grape it is not very high in either sugar or acid, so that used alone, the wine is not of note, but its mildness makes it particularly valuable to blend with those a little too acid. It is a *Vulpina*, *Labrusca* hybrid, introduced by Jacob Rommel, Missouri's great viticulturist, in 1869.

Etta resembles Elvira, of which it is a seedling, in bunch and berry, except that the bunch has a very large shoulder and the

flavor of the berry lacks the slight foxiness of the parent. The vine is vigorous and productive to a fault. The fruits are a little later, ripening with Catawba, and do not crack as badly as those of Elvira. It makes a rather better white wine, though much the same, but lacks the foxiness of newly made Elvira. The variety is another of Jacob Rommel's seedlings, introduced in 1879.

Eumelan is one of the best American grapes for red wines, and is excellent to eat out of hand as well. The vines are above the average in vigor, productiveness, and hardiness; the clusters are large and well formed, with large, handsome, glossy black berries; the flesh is tender and very juicy; the flavor is rich, sweet, juicy, vinous, and exceedingly good. The season is early, yet the grapes keep well. Three very marked faults keep Eumelan from becoming one of the best American red grapes: it is self-sterile and must be planted with other varieties; it is attacked by mildew so vigorously that it needs much spraying; and it is so difficult to propagate the vines that nurserymen do not grow it. In spite of these faults the grape and wine epicure must have Eumelan in his vineyard.

Fern Munson is a grape for the South and Southwest. The vines are vigorous, productive, and stand drouth very well. The clusters are large and are composed of large bluish-black berries, very good in quality. The season is late. Presumably the grapes could be used for a red wine. The variety is one of Munson's post-oak grapes fertilized with mixed pollen.

Flowers is a dark-red Rotundifolia, once much grown in the Carolinas. It is noted for its vigorous productive vines and its large fruit clusters, with berries that cling well for a variety of this species. The crop ripens very late and keeps well. The fruits are not particularly good to eat out of hand, but make good grape juice and a good Rotundifolia red wine.

Fredonia (Plate xvii) is a good early black grape. The vine is vigorous, hardy, and productive, and ripens two weeks earlier than Worden. The clusters are medium in size, cylindrical and compact; the berries are large and round, with skin thick and tough and flesh solid but tender; very good. Fredonia is rapidly becoming a standard variety. It is another variety from the Geneva station.

Golden Muscat (Plate xviii) possesses the rich golden color of Diamond and the fine muscat aroma of the European Muscat. For home use it is one of the best. The vine is vigorous, productive; the clusters are very large, tapering, single-shouldered, and compact; the berries are large, oval, juicy, tender, sweet, vinous, and aromatic. It requires a season about ten days longer than that of Concord. This is one of the finest of the grapes from the Geneva station.

Gold Coin is a very good grape in the South, the only location in which it thrives. The vines are vigorous, productive, and fairly free from fungous diseases. It is very late. It is a cross between Norton (an Aestivalis) and Martha (a Labrusca). The grapes are reddish amber and make a very good white wine.

Hanover is a red grape introduced by the New York Station some years ago. Its value is still problematical, but it is worth trying. Its clusters are medium to large, compact; the berries are medium, slightly oblong, and dark red; the flesh is slightly tough, sweet, vinous, and good in quality; it ripens about October first.

Headlight is more desirable for southern than for northern vineyards, yet it is worth planting in the North. Its meritorious characters are: productiveness, outyielding Delaware, with which it competes; disease-resistant foliage and vines; more than average vigor of vine; high quality of fruit, being almost the equal of Delaware in flavor, and having tender, melting pulp which readily parts from the seeds; and carliness, ripening before Delaware and hanging on the vines or keeping after being picked for some time without deterioration. The originator of Headlight, T. V. Munson, states that the variety came from seed of Moyer fertilized by Brilliant.

Hector was produced at the New York Station by crossing Chasselas Rose with Brocton. The vine is strong, vigorous, and productive; the clusters are large, compact; the berries are medium, roundish oval, medium red; the flesh is slightly meaty, juicy, sweet, vinous, and good. Those who like Chasselas should try Hector. The season is after Concord. The variety is promising for table and wine.

Herbemont is one of the best wine grapes for the Gulf states—elsewhere it cannot be grown. Even in the far South it fails in any but warm, well-drained soils. The bunches are large and beautiful, because of small, compactly clustered glossy black grapes. Neither flesh, skin, nor seeds are objectionable in eating, and the flesh is rich, sweet, and, all in all, most excellent. The sugar and acid content are just right for red wines. *Herbemont* is a Bourquiniana grape known to have been cultivated in Georgia as the Warren before the Revolutionary War. The present name commemorates Nicholas *Herbemont*, a noted horticulturist of Columbia, South Carolina.

Hopkins is the best early Rotundifolia grape for the far South, the only place it thrives. Its season in North Carolina begins in August, nearly a month before any of its kin. The vine is very vigorous, healthy, and productive. The clusters contain from four to ten large almost black grapes of very good quality—one of the best of its species. It is too early to have value for wine.

Hungarian is a Vulpina grape very like the well-known Beta in fruit and vine, though the fruits are a little better in quality, and the vines are a little less hardy. It ripens early. The wine is drinkable and when aged not wholly bad. It is one of the few grapes that can be grown in the northern parts of the States of the Great Plains.

Hybrid Franc is the best known of the hybrids between Vinifera and Rupestris. It is much used in Europe as a resistant stock and as a direct producer for a red wine. It might well be used for both purposes in eastern America. The red color is very intense and might be used to give color to native wines. (The writer once fermented Iona on the skins with about one-quarter *Hybrid Franc* and made a really delicious red dry wine.)

Iona is a favorite grape with epicures, either to eat out of hand or for a dry white wine. The grapes have a rare combination of sweetness and acidity, pure, delicate, vinous. In texture of pulp, it is perfect—tender, juicy, and with few small seeds which part readily from the flesh. The color is amethyst, not always attractive, a little lighter than that of Diana. The bunch is large, loose, with

medium-sized berries. The fruit is late and may be kept until Christmas. Unfortunately, the vine is the poorest in the vineyard. It must have a soil exactly suited to its wants: it does well only in deep, sandy, or gravelly loams. Iona is hardy only where the peach is grown. The vines are inclined to overbear and need close pruning; they are much subject to fungi. Iona originated with C. W. Grant, Iona Island, in the Hudson, in 1885. It is a seedling of Diana (see Plate xv) which it resembles, though the grapes are lighter in color.

Isabella, a hundred years ago, was the mainstay of American viticulture; even now old vines may be found and it is occasionally planted. The bunches are beautiful, with large, round, glossy black berries. The flavor is good, though there is a little too much foxiness. Its season is that of Catawba or a little earlier. The vines are not productive, for which reason Concord took its place. The foliage is ample, very ornamental, and hangs late, making it a favorite for arbors and porches in which places it may often be found in all the North Atlantic states. White wines are better than reds from Isabella, and it is still used, where obtainable, for Champagne. It is one of the few American grapes grown in Europe. William Prince, the great nurseryman of Flushing, Long Island, introduced Isabella in 1816.

James is one of the largest and handsomest *Rotundifolia* grapes, without exception the best general purpose variety of this species; it ripens late and hangs long on the vine. It grows as far north as Maryland. James grows best in sandy soils but likes a clay sub-soil. It was found in the wild by B. W. M. James, Pitt County, North Carolina, and was introduced in 1890.

Janesville is a *Vulpina* (it may be a hybrid with *Labrusca*), which withstands cold to which most other grapes succumb. The clusters and berries are small and the fruits are pulpy, sour, foxy, tough, seedy, have thick skins, and are fit only for culinary purposes. The season is early. Besides being hardy, the vines are vigorous, healthy, and productive. Wine from Janesville is undrinkable. The variety was discovered, a chance seedling, in Janesville, Wisconsin, in 1858.

Jewel, a seedling of Delaware, is really a black Delaware, as good in flavor and all that constitutes high quality. The vine is a little more vigorous, healthy, and hardy. It is earlier than Delaware and can be grown farther north—wherever the pear is grown. It is one of the few early grapes from which a good red wine can be made. John Burr, noted in several fields of horticulture, of Leavenworth, Kansas, grew Jewel from seeds of Delaware planted in 1874.

Kendaia, a new early grape from the Experiment Station, Geneva, New York, is a cross between Portland and Hubbard. The vine is vigorous, hardy, and productive. The clusters are medium to large, shouldered and fairly compact; berries large as Concord, similar in color, roundish, persistent; skin medium thick and tough; flesh juicy, sweet with a pleasing aroma, very good. It should prove to be an excellent table and wine grape.

Keuka is more nearly a European than a native grape. Bunch and berry are medium in size, but the bunch is compact and as trim as a well-formed cluster of Delaware. The berries are round-oval, dark red with a heavy bloom, which gives them a lilac color. The flesh is crisp and juicy with a sweet, Vinifera flavor, and scarcely separates from the tender skin, so that the berries may be eaten skin and all. The vines are vigorous, healthy, productive, medium hardy, and ripen their crop about with Catawba. It should be a very good grape for white wines. Keuka is a relatively new variety from the New York Experiment Station.

Lenoir, if judged by its synonyms, is one of the most notable American grapes, it having been grown under twenty or more names. It is a tender southern grape, though grown in France and California for a stock and a direct producer. The grapes are small, round, dark purple, with tender, juicy, sweet, rich flesh which contains much coloring matter; it makes a very good red wine. Lenoir belongs to Bourquiniana and has been cultivated in the Gulf states since 1800; its history is long and full of romance, with nothing very certain about it.

Mish is a favorite black Rotundifolia in North Carolina, where it is very generally planted. Its vines are vigorous and productive, and the quality of the fruit is so good that it is a favorite of its

species for dessert, grape juice, and red wines. It is late in ripening. The grape was found in the wild about 1846 by W. M. Mish, Washington, North Carolina.

Montefiore is a bluish-black Vulpina, once and possibly now commonly grown in Missouri and Arkansas; it is almost unknown in the North and East, though it grows well at Geneva, New York, failing only in being uncertain in bearing and productiveness. Though pleasing in taste and texture, the grapes are usually grown for red wines. *Montefiore* ripens in mid-season and keeps long. This is another of Jacob Rommel's good grapes, grown from a seed of Taylor fertilized with pollen from Ives.

Niagara has long been the leading American green grape, though it does not deserve so high a place and is now being displaced by several better greens. It is not hardy in regions where the peach cannot be grown; the fruits are so foxy in taste and aroma that many do not like them, and they are unfit for wine of any kind; the berries shell badly and do not keep long. The bunches and berries are exceptionally handsome. The vines are fairly vigorous and productive in most grape soils, but foliage and fruits are very susceptible to black-rot and other fungous diseases. The crop ripens in mid-season. *Niagara* came from a seed of Concord fertilized by Cassady, another Labrusca; who made the cross is a matter of dispute, but its original home is Lockport, New York.

Noah is a white Vulpina, so much like *Elvira* that a separate description is not necessary. It is a better grape than *Elvira*, though not so commonly grown, the berries being less foxy, and the skins do not crack so badly. The large green leaves make *Noah* a handsome ornamental. Its wine is very good and so alcoholic that the originator, Otto Wasserzicher, Nauvoo, Illinois, named it *Noah*, holding that the lamentable accident which befell the ancient patriarch might easily have happened had he partaken of the wine of this grape. It is seldom planted in the North.

Norton (Plate xix) is the best red wine grape in eastern America. The vine is hardy but the grapes require a long, warm season to mature. The grapes do not ripen in most seasons north of Maryland. The vines are robust, very productive, as free from

fungous diseases as any other grape, and wholly resistant to phylloxera. The bunches and berries are rather small; the berries are black, rich, spicy, pure-flavored, and very good. A fault is that the vines are difficult to propagate and to transplant, and do not bear grafts well. It would take many pages to recount the history of this variety, but Prince of Flushing, Long Island, introduced it in 1830 with the statement that it came from Dr. D. N. Norton, Richmond, Virginia.

Ontario is a cross between Winchell and Diamond, which comes in season before Winchell, hitherto the best early green grape. Bunches and berries are larger and more attractive than those of the parents, and unlike those of either parent are usually single-shouldered. The vines are more vigorous and more productive. Ontario and Portland are becoming the standard early green grapes in eastern America. Both are introductions from the New York Experiment Station at Geneva. Ontario was introduced in 1908.

Portland holds first place among grapes as an early green variety for the market. The vine is very vigorous, hardy, productive and healthy. The variety is remarkable for its luxuriant and persistent foliage. Bunches and berries are larger than those of any other early green grape. Neither Ontario nor Portland are especially good for wine, though Ontario is being used rather freely for a white sweet wine on the Canadian side of the Niagara Peninsula. Portland was introduced in 1912.

Rommel is little cultivated in the North, where the vines are not very vigorous, hardy, or productive. They are very susceptible to the leaf-hopper, and the rather large but poorly flavored grapes crack as they ripen. It is worth growing in the South for a table grape and makes a very good white wine. Rommel is a Munson hybrid from a seed of Elvira, cross-pollinated by Triumph, which was planted in 1889.

Ruby is a cross between Keuka and Ontario, ripening about the middle of September. It is one of the most attractive of the reds. The vine is vigorous, hardy, and productive; clusters medium to large, tapering, shouldered, fairly compact with medium roundish-



PLATE XIX. Norton



PLATE XX. Seneca

oval berries; flesh juicy, tender, melting, sweet with a very agreeable and pleasing vinous flavor; the skin has enough thickness and toughness to make it an excellent keeper. Ruby is most promising for both table and wine. This is a rather recent introduction from the New York Experiment Station.

Scuppernong, the chief representative of *Rotundifolia*, grown in the South under a score or more other names, is the leading white grape of its species. It runs riot in fields and vineyards from Maryland to the Gulf and west to Arkansas and Texas. In this great region it is a good grape for culinary purposes and white wine. It is often found as an ornamental on arbors, summer-houses, and fences.

Seibel hybrids, from France, now under test at the New York Station, have distinct promise as grapes for red and white wines and should be considered well by grape collectors. At least a dozen show great promise. They ought to be tested in all American grape regions. In France they are used for stocks and as direct producers for wines.

Seneca (Plate xx) is almost a pure *Vinifera*, ripening with *Ontario*. The bunches are medium in size, tapering, compact; berries oval and yellow. The texture is firm like that of a true *Vinifera*, melting and tender, while the flavor is sweet, vinous, and aromatic. The skin can be eaten with the berry. The vine is vigorous, healthy, productive, and hardy. Seneca ought to make a good white wine.

Sheridan is a promising late-keeping grape to extend the season of *Concord*. Compared with *Concord*, the plants are just as vigorous, healthy, hardy, and more productive; the bunches are larger and more compact; the berries firmer and as large; the flavor sweeter and richer; the season is a week later and the grapes are less subject to shelling. It remains to be seen whether *Sheridan* will grow in as wide a variety of soils as *Concord*.

Stout Seedless is a *Sultana* offspring named in honor of Dr. A. B. Stout, who is co-operating with the Geneva Station in breeding seedless grapes. The vine is fairly hardy but should not be grown in cold climates. The fruit ripens in mid-season; clusters

large, medium compact; berries small, oval, greenish, yellow, juicy, sweet, vinous and very good.

The last three grapes are from the New York Experiment Station.

Triumph is one of the handsomest and best American grapes for regions where the season permits it to ripen. It is a little later than Catawba. The variety is a cross between Concord and Chasselas Musque, a Vinifera. The vine is almost identical with Concord and the fruit is pure Vinifera—the great desideratum of every American grape breeder, a Vinifera grape on an American vine. No other grape in eastern America approaches Triumph in size of bunch and berry, in color, or in flavor and aroma. The color, by the way, is a beautiful golden green. Unfortunately, it chooses to grow only on certain soils, certain climates, and is very subject to fungous diseases. Nevertheless, every epicure of grapes should try at least a few vines of Triumph, giving it special care if needed. The variety was originated by George W. Campbell, a noted breeder of grapes, soon after the Civil War.

Urbana requires a long season and cannot be grown with certainty where Catawba does not ripen. The vines are vigorous, healthy, and productive, and will withstand as much cold as Catawba. Bunch and berry are large and very attractive. The berries are light red with skins that cling to the pulp, and the flesh separates readily from the two or three small crackling seeds. The flesh is firm but tender, juicy, aromatic, and has a rich, sweet, vinous, spicy, refreshing flavor. The grapes keep in common storage without shriveling, shelling, or decaying until March.

Van Buren is a promising, very early, black grape, recently introduced. The cluster is medium to above medium and compact; berry smaller than Concord and superior to Concord in quality. It should prove most valuable for an early dessert grape.

Watkins is noteworthy for high quality. The vine is vigorous and productive; clusters medium to above, slightly tapering and loose; berries reddish-black, medium in size, oval; flesh meaty, juicy, sweet. It is promising for home use and for a red wine.

Westfield is a Herbert by Concord cross. The grapes ripen before Concord and resemble Concord in color; the clusters are medium in size and very compact. The berries are medium in size and firmness. The juice is exceptionally highly colored, making this new variety most promising for red wines.

Yates is a cross between Mills and Ontario, a red seedling from two fine grapes. The vine is vigorous, productive; the clusters are large, conical, medium compact; the berries are large, attractive, medium red; the flesh is juicy, nearly melting, sweet, vinous, pleasing, good. Ripens after Concord. This is a promising new grape for dessert and wine.

The last five varieties are recent introductions from the New York Experiment Station.

VARIETIES OF *VINIFERA* GRAPES FOR EASTERN AMERICA

The New York Agricultural Experiment Station, Geneva, New York, has fruited with more or less success as many as 200 *Vinifera* grapes. Of these the following kinds, briefly described in Circular 101, published in 1934, are worth trying in any of the grape-growing regions east of the Rocky Mountains.

Csaba holds the distinction of being the earliest *Vinifera* variety to ripen and is as early as any native grape. Unfortunately, at Geneva, at least, it is a shy bearer. Its fruit is golden yellow, sweet, with a slight Muscat aroma.

Khalili ripens a little later than *Csaba*. The fruits are small, oval, greenish-yellow, and, all in all, very good in quality. Like *Csaba* it is not productive, but nevertheless is well worth growing.

Madeleine Angevine is another very early greenish-yellow grape. The berries are small, cliptical, and have a sweet, vinous flavor most agreeable to the taste. This variety, at Geneva, is much more productive than the two preceding ones.

Muscat de Saumur is a very early variety of the Muscat type. Its clusters are small and tapering; berries of medium size, round, greenish-yellow, sweet, melting, very good. The vines are usually fairly productive.

Précoce de Malingre is still another early greenish-yellow grape that might well be tried. Its clusters and berries are rather small but the bunches are very compact. The grapes are tender, sweet, vinous, and highly flavored, with a pleasing oval shape. The vines are productive.

Madeleine Noire (*Précoce de Julliet*) is the earliest good black. The clusters are rather small, as are the berries. The fruits are oval, black, juicy (the juice uncolored), sweet, vinous, with melting flesh. The vines are only moderately productive at Geneva.

Noir hâtif de Marseille is another very early black, much like the former in bunch and berry. The berries are round, firm of flesh, sweet, with a very decided Muscat flavor. The vines are none too productive.

Blauer Portugiesser is the first good wine grape to ripen at Geneva. Its season is a week earlier than that of Concord. The berries are black, juicy, tender of flesh, thin-skinned, of medium size, oval, and are borne in small compact clusters. This is a splendid grape to make a red wine to blend with that of the harsher native wines.

Muscat Saint-Laurent is another yellow-green grape of the Muscat family. Its bunches and grapes are of medium size and are borne in only moderate quantities. The grapes are round-oval, tender, juicy, sweet, very good.

Chasselas Golden is at Geneva the most satisfactory of all the Viniferas. The vine is prolific, reliable in bearing, of easy culture; the grapes and bunches are fairly large, and the berries are delicious to eat out of hand. The fruits are greenish-yellow, juicy, tender in flesh, sweet and vinous in flavor. A very good white wine may be made from this variety.

Chasselas Rose (Plate xxii, see page 187) and *Chasselas Violet* are identical with Chasselas Golden in all characters save color.

Lignan Blanc is another of the early greenish-yellow grapes worth growing. It is a little less hardy and productive than Chasselas Golden, and, perhaps, the quality is not so good, but it ripens a week earlier and the fruits keep well. The clusters are above

medium and bear rather large, oval, yellow-green, firm, juicy, sweet berries; very good in quality.

Pinot Blanc, *Pinot Gris*, and *Pinot Noir* are all excellent wine grapes, and grape-growers who want *Vinifera* juice or wine to blend with the product of American grapes should try these three. As their names indicate the first is white, the second dull red, the third black. The berries of *Noir* are larger than those of the other two, and though the skin is black, the juice is colorless. The bunches and berries are small to medium; the berries are tender, vinous, sweet, and, all in all, very good in quality.

Rouge de Bouze (*Gamay Teinturier*) ripens with the Pinots and like them is an excellent grape for wine. The clusters are of only medium size, and the berries are rather small; the grapes are round-oval, black, with a thick bloom, juicy, sprightly, very good. The vine is vigorous, moderately productive, and has red-tinged foliage in the autumn, which makes it a handsome ornamental vine.

Cinsaut is a dessert and wine grape that ripens a week later than Concord. The clusters and berries are large; the grapes are red to black, oval, juicy, vinous, sprightly, and very good. The vines are moderately hardy and productive.

Syrah, or *Petite Syrah*, is the best of the *Vinifera* grapes to grow east of the Rocky Mountains for a red wine. Its season is that of Catawba. It is an especially good variety because of hardiness and productiveness. The bunches are below medium size, tapering and compact; the grapes are rather small, black, juicy, sprightly, and very good in quality. The skin is thick and tough, carrying much pigment, but the juice is colorless, so that either a red or a white wine can be made from the fruit.

Zinfandel, one of the leading wine grapes in California, is not quite hardy at Geneva but is worth trying in the East wherever Catawba ripens. Its clusters are very large, compact; berries large, round-oval, juicy, vinous, sprightly, very good in quality. The juice is colorless and the grapes may be used for a white wine as well as red. Vines productive.

Muscat de Hamburg is one of the very best late grapes to eat out of hand. Its grapes and bunches are both large. The berries are

oval, reddish-black, sweet, vinous, very good. It ripens with Catawba. Vines are vigorous and productive.

Rosaki is another very good late dessert grape. Its clusters and berries are large. The grapes are melting, sweet, vinous, and of the best. It should be planted only where Catawba ripens. The vines are productive.

The difficulty in growing these Vinifera grapes is that it is not easy to get plants of most of them. Some can be bought from California. In normal times it is not very difficult to get some from Europe.

Most of the information in regard to varieties of European grapes given here is taken from Circular 101, March 1, 1934, written by Richard Wellington, New York Agricultural Experiment Station. Under date of 31 December, 1942, Mr. George D. Oberle, now in charge of the vineyards at the Geneva station, under the direction of Mr. Wellington, writes me as follows about varieties of European grapes:

The best Vinifera varieties we have are of the Chasselas type. Of these Chasselas Golden and Chasselas Rose or Chasselas Violet, which seems to be merely a color variation of Chasselas Rose, are outstanding. Chasselas Duhamel is another good white-fruited variety, as is Chasselas Ciotat, which should be included because of its attractive 'parsley-leaved' foliage. Chasselas Napoleon (also known as Bicâine), has huge berries and clusters. Another of this type which bears tremendous clusters is English Colossal, a red-fruited variety.

For early grapes I would include Khalili and Perle de Csaba, both of which are white-fruited grapes and ripen before even the earliest of American sorts. Both are of fine quality and fairly productive. The Madeleine types, though early and of good quality, have been too weak and irregular in bearing to be worth planting.

Some blue or black varieties should be included, and in my opinion the best of these are Frankenthal Noir (Black Hamburg), Ribier, and Muscat Hamburg. We have two black-fruited Muscats which are less susceptible to disease than Muscat Hamburg but I doubt whether they are listed by nurserymen in this country. They are Albardiens and Shuvargani, both of which came

to us from the Black Sea. Muscat Rouge and Muscat de Frontignan are good Muscat types also. Muscat Blanc d'Alexandria is too late for this region.

Among seedless types only Sultanina Rose, Sultana and Black Monukka are worth planting at Geneva.

Konigen der Weingarten, a fine quality, mid-season, white, would be included on this list if it were readily available from nurserymen.

PART II
WINES FROM A HOME VINEYARD



15. American Wines

GRAPES are grown for wine in North America from the Atlantic to the Pacific and from Canada to the Gulf. Some wine is made from all the ten species of which there are varieties in American vineyards. A study of census reports shows that 90 per cent of the commercial wines produced in the United States come from California, and from one species, *Vitis vinifera*, the Old World grape. The ten per cent remaining are made from varieties of the several species of native grapes growing in the states east of the Rocky Mountains.

There is, however, much more wine made in the United States than is reported to census takers. Those of us who visit the homes of grape-growers the country over know that the owners of vineyards ferment a good deal of wine for themselves and their friends, and that much more is made by people living in towns and cities. How great the quantity is is impossible to estimate accurately.

The only figures the author has seen regarding the quantity of wine produced in American homes are given in the magazine *Fortune* for September 1943. In it a writer says that during Prohibition 150,000,000 gallons of 'basement wine' was made per year, and that 30,000,000 gallons of wine is still being made every year in basements.

Besides the household wine from grapes—real wine—possibly as much more so-called wine is made from cherries, rhubarb, currants, blackberries, dewberries, and not a little from parsnips, from which a rather good sweet alcoholic beverage, supposed to taste like the famous Malmsey wine of southern Europe, is made. These

drinks are often used under the impression that though 'they warm the insides,' they are not alcoholic, and they do not in any way violate 'temperance principles.' Quite to the contrary, most of them are very alcoholic.

Those who know European and American wines agree that the best American wines are not so good as the best European wines. That they might be, or that some time they will be, is quite a different matter. When American grape-growers pay as much attention to soil, varieties, and to the care of vineyards, and take as great pains in making wines as Europeans do, the wines of this country may be as wholesome and pleasant to drink as those of European countries.

Wine-makers of America cannot duplicate the wines made in Europe. Not even in California, where the grapes used for the famous European wines can be grown, is it possible to make comparable Burgundies, Clarets, Sauternes, Ports, Sherries, Tokays, and Madeiras. The reason for this is that wine is given its flavor and aroma by the soil and climate in which the grapes are grown. American wines are quite distinct in their character, and often as good, but should have American and not European names.

Wines made from grapes of native species have a particularly unique flavor and perfume. Wines from Labrusca grapes have a more or less 'foxy' taste and bouquet that clings to them to the end; wines from Vulpina, Aestivalis, Lincecumii, or Rotundifolia varieties all have lusty, tangy tastes that seem strange to palates accustomed to Old World wines; but they are liked by those who know them. Millions of Americans prefer Catawba, Delaware, Dutchess, Iona, Diana and other American varieties to any European grapes; there are no reasons why they should not prefer wines made from these varieties if they are well made.

Sparkling white wines made in Europe, America, South Africa, South America, and Australia are called Champagnes, though strictly speaking the name should be used only for sparkling wines made in the old Province of Champagne, France. The natives of each continent will tell you that they like their domestic sparkling wines best. There may be some Europeans who prefer American

Champagne, however. This is suggested by the following quotation from the autobiography of Andrew D. White, college president, diplomat, and European traveler. He writes:

Dining with Count Ressi, at his noble Villa on the slope of Fiesole [Florence], I noted various delicious Italian wines upon the table, but the Champagne was what is known as 'Pleasant Valley Catawba' from Lake Keuka, in Western New York, which the Count, during his journey to Niagara, had found so good that he had shipped a quantity to Florence.

AMERICAN WINE-REGIONS

At the risk of repetition, we must go again into the grape regions of the United States and Canada, this time with special reference to the wines that come from them. If wines alone be considered, California, a region to be barely mentioned at the end of this chapter, is far in the lead. The second most important wine-region in the United States is found about the Finger Lakes in west-central New York.

THE FINGER LAKES WINE-REGION

There are some eight or ten lakes in west-central New York, on the shores of four of which grape-growing has long been an important industry, as has wine-making on or near two. Grapes could be grown in the vicinity of all these lakes, large and small, but at present most of the wines made from grapes grown near the Finger Lakes come from the Keuka and Canandaigua lakes in Steuben, Yates, Schuyler, and Ontario counties. The seats of the wine industry are at Rheims, Hammondsport, and Penn Yan on Keuka Lake, and Naples, near Canandaigua Lake.

Keuka Lake is the largest center of the sparkling-wine industry in America. It is worth while tracing the history of the grape and wine industries in this region. Grapes were first grown on the shores of Keuka Lake in 1830, when the Reverend William Bostwick planted a vineyard at Hammondsport at the southern end of the lake, the varieties being Isabella and Catawba. Soon there were

scattering vineyards on both sides of Keuka from Hammondsport to Penn Yan at the northern end.

Commercial grape-growing and wine-making really began here when Andrew Reisinger, a German vintner, planted a commercial vineyard in the town of Pulteney, planting Isabella and Catawba, the only varieties then well known. Reisinger trained, pruned, and cultivated his vines, operations unheard of before in the region, and was rewarded with crops and profits that made his vineyard a veritable gold mine.

In 1860 Charles Davenport Champlin established the Pleasant Valley Wine Company at Rheims, near Hammondsport, then the center of grape-growing in the Keuka district. The object of the company was to make wine, brandy, and Champagne. Wine and brandy had been made in quantity before in many parts of America, but here at Rheims, in 1860, was the beginning of the sparkling-wine industry in the New World. It was necessary to bring to America Champagne makers from France, and Joseph Masson came over and was installed as Champagne-maker in the new company. He, in turn, was followed by Jules Masson, and he by his son, Victor. Since the Champlins continued to be identified with the Pleasant Valley Company, it may be said that these two families, the Champlins and the Massons, founded the sparkling-wine industry in the United States.

At the start, the Champagne made by this company was called 'Sparkling Catawba,' but early in the history of the Pleasant Valley Wine Company the elder Champlin sent a basket of sparkling Catawba to Marshall P. Wilder, of Boston, a man of affairs, long President of the American Pomological Society, and a leading horticulturist in the country. A banquet was held at which the great of Boston were present. To Bostonians, any place west of Massachusetts was in the West. To the literary lights at the banquet, the best name for this sparkling wine seemed to be 'Great Western,' since it had come 'from our great Western Country.' The sparkling white wine made by the Pleasant Valley Wine Company ever since has been 'Great Western.'

In 1865 the Urbana Wine Company, at the hamlet of Urbana,

a few miles north of the southern end of Keuka Lake, on the west side, was organized and began making still and sparkling wines. This company also imported French Champagne-makers.

One by one, other wineries were founded until as many as twenty-five were in operation before Prohibition. To supply these wineries, and the table-grape industry as well, the sixty miles of shore line, back from the lake a half-mile to three or four miles was at one time, before the terrible drouth of Prohibition, a continuous stretch of trellised vines. The vineyards are for the most part on the slopes of steep, strong bluffs, cut by deep gullies, seemingly impossible to cultivate, but on which, nevertheless, grapes for the best white sparkling wines, 'American Champagnes,' are produced in the New World. Plate xxi shows vineyards on the shores of Keuka Lake.

Naples, near the southern end of Canandaigua Lake, is another center of wine-making, comparatively small at present, but capable of wide expansion, where now some of the best white wines in the Finger Lakes region are made. Grape-growing about Naples began in 1848, and at the time there must have been vineyards in the neighboring county of Livingston, for cuttings for the earliest vineyards at Rheims and Naples came, in part at least, from Avon, Livingston County.

The varieties grown for wine-making in the Finger Lakes region are chiefly Catawba and Delaware, than which for white wines and Champagnes there are, all things considered, none better. Wines from both are a little tart and need in most seasons to be blended with milder wines. A good many Dutchess, Iona, and Diana, all splendid white wine grapes, are grown, but all need to be wooed in the vineyard with every kind of care to yield profitable crops. Elvira makes a very bland wine, much used in blending with the tarter white wines.

Besides these standard sorts, Diamond, Missouri Riesling, Noah, and Rommel might be grown, as might also several of the new grapes from the New York Experiment Station: Dunkirk, Eden, Hector, Keuka, Ontario, Portland, Urbana, and Yates, all of which offer possibilities for white wines.

There are not so many good grapes for red wines. Probably more Concords are used for red wines than any other variety, chiefly because the grapes are cheap and abundant, certainly not because its juice makes a good wine. A dry wine from Concord is hardly drinkable, and its sweet wines are mediocre unless blended with a better wine. At present the best grapes that can be grown about the Finger Lakes for red wines are Ives, Eumelan, Clinton, and Clevener, of which Ives and Eumelan make the best wines. The color and body of wines from Clinton are good, though the flavor is a little too tart. Several new grapes, as Hanover, Ruby, Sheridan, and Westfield, and, more particularly, several Seibel hybrids now under trial give some promise for red wines.

The future of this great wine region, as in the case of every other part of America in which wines are made, depends first upon finding ideal varieties for the land and the wine; and, second, to drop European names with the accompanying inferiority complex, substituting good honest all-American place names—or, possibly, to use, as in the early days, the names of the grapes from which the wine is made. What could be better in the way of names than Sparkling Catawba, Dry Catawba, and Sweet Catawba?

THE CHAUTAUQUA GRAPE BELT

The second most important grape region in eastern America is in the Chautauqua Grape Belt, lying along the southeastern shore of Lake Erie. The northeastern boundary is the line dividing Erie and Chautauqua counties, where a narrow belt, some three or four miles in width, lies along the shore of Lake Erie, fifty or more miles in New York, on into Pennsylvania. Not all but most of this belt is suitable for grape-growing. Climate, soil, and lay of land are exceptionally favorable to growing grapes. There are about 30,000 acres in this strip planted to grapes. The first grapes in this now famous region were planted by Deacon Elijah Fay, in 1818, near the present town of Brocton. The vines were wild plants of *Vitis Labrusca*, brought from Deacon Fay's boyhood home in New England. The wines grew with the encouraging vigor of a wild Labrusca, but the grapes were as small and foxy. A record planting



PLATE XXI. Vineyards on the shores of Keuka Lake



PLATE XXII. Chasselas Rose

was made in 1822 of Miller's Burgundy, Sweetwater, and Black Hamburg, all tender varieties of the European *Vitis vinifera*. This second experiment was a more complete failure than the first. Indomitable Deacon Fay now planted a third vineyard.

Vines of Catawba and Isabella were obtained from Prince of Flushing, Long Island. The vineyard was two rods wide and eight rods long. The vines were trained on trellises. Vines and grapes were perfect. From the site of this successful vineyard in what is now the Chautauqua Grape Belt, one sees today more grape-vines than can be seen from any other one point east of the Rocky Mountains.

In the days when Deacon Fay grew grapes, this fruit was grown for only one purpose—to make wine. In 1830 from the product of the Fay vineyard, ten gallons of wine were made for home use. From then on, until 1853, the grapes of the region went into home wine-cellars. In 1859 one of Deacon Fay's sons and G. E. Ryckman built a wine-cellar at Brocton and turned all the surplus grapes of the Grape Belt into commercial wines. This early history of the Chautauqua Grape Belt was given to the author in 1905 by Mr. G. E. Ryckman, then a venerable old man.

Meanwhile, by 1860, the Concord had become well established, and more and more grapes were grown for table use and less and less for wine. Now, much of the crop of this grape belt is converted into unfermented grape juice. Probably at this time, 90 per cent of the grapes grown in the Chautauqua Grape Belt are Concords, about 2 per cent Niagaras, and the rest a sprinkling of a dozen other sorts, of which Delaware leads.

Far less wine is made in the Chautauqua Grape Belt than about the Finger Lakes, both because the soil is less well suited, and, more particularly, because Concord is not a good wine grape. Some day, with the introduction of better wine grapes, this region will become an important center of wine production in eastern America.

GRAPES IN THE HUDSON RIVER VALLEY

The third most important grape-growing district in New York is the valley of the Hudson River, from Tarrytown on the south to

Hudson on the north. There are in this valley, chiefly in Columbia, Dutchess, Ulster, and Orange counties, some 7,000 acres of grapes. The grapes are sold in near-by cities in New York and New England, and probably a larger proportion of them are used for home wine-making than is the case of any other grape region east of the Rocky Mountains.

The Hudson River Valley has a glorious past in American viticulture. Soil, climate, varieties, and abundance of labor for harvesting the crop all favor the cultivation of the vine and wine-making.

Commercial viticulture in the Hudson River Valley was begun by Robert Underhill in 1827 when he planted a vineyard, eventually covering seventy-five acres, at Croton Point. The varieties were Isabella and Catawba, as good wine grapes as any now grown.

But there had been grape-growers and wine-makers for home use long before Underhill's commercial venture. French Protestants, many of whom settled about New Paltz, Ulster County, as early as 1667, tried to grow European grapes, and, failing, turned to wild grapes and made wines for home use. Later, these Frenchmen also planted Isabella and Catawba.

The Valley of the Hudson is the birthplace of viticulture in America. We have seen that the Princes and Parmentier were early distributing agents for American grapes, and that in their nurseries men were trained to grow grapes. Again we must mention the names of Robert, Stephen, and A. K. Underhill, of A. J. Caywood, J. H. Ricketts, and C. W. Grant, all early and prolific breeders of native grapes. Here William Kniffin first demonstrated his method of training grapes, thereby putting a stop for ever to European methods of pruning American grapes. Here, the Downings, at Newburgh, became authorities on grapes and wines in the middle of the nineteenth century.

No doubt, wines were made and sold in a small way in this region from the Revolution on, but there are no records of any winery of large size until 1839, when the Brotherhood Wine Company was established with vineyards and cellars at Washingtonville, Orange County, and an office and warehouse in New York City.

This company was called 'The Brotherhood' because it was established by an agricultural and grape-growing co-operative religious community. Down the years until Prohibition, The Brotherhood Wine Company was one of importance in eastern wine-making, producing wines of Claret, Burgundy, Riesling, Sauterne, and Champagne types and a long list of red and white sweet wines. These wines demonstrated that very good wines could be made from grapes grown in the Hudson River Valley.

From time to time other wineries have made good wines in the Hudson Valley, their output being cut short by the rising demand for wine for table use and by home wine-making at high prices in this region of large cities. Here, indeed, in the Hudson River Valley are magnificent opportunities to establish home vineyards and wineries for making wines from native grapes.

THE NIAGARA GRAPE AND WINE AREA

The Niagara Grape area lies along the southern shore of Lake Ontario, a hundred miles from Niagara Falls eastward to Rochester, in the United States, and around Canada from Niagara to Hamilton. In this area there may be now as many as 5,000 acres of grapes, though there may have been in the early part of this century twice that acreage, and good vineyards might well be planted on ten times as many acres. The varieties have always been and are now much the same in the Niagara Area as in the Chautauqua Grape Belt, although at the former the Niagara grape was produced.

C. L. Hoag and B. W. Clark of Lockport, New York, in 1868, planted seeds of Concord, fertilized by Cassady, and from this cross obtained Niagara. Fruit was first shown in 1872, but it was not until the 1890's that the Niagara craze struck the country. Niagara was heralded as the perfect grape for table use and wine, and millions of vines were set in vineyards. It was soon discovered that Niagara was too foxy in taste and odor to please many and that the wine was so musky in taste that it was scarcely fit to drink. No one would think of planting Niagara now, and, though

still grown and used in making sweet white wines in Canada, vineyards are rapidly being taken out.

More wine is made in the Canadian part of the area than on the New York side—rather poor stuff, though it might be very good. This is another area of lost opportunity. The region could well support thousands of vineyards and make millions of gallons of good wines, red and white, dry and sweet.

GRAPES IN OHIO AND PENNSYLVANIA

About 1818, an enterprising German, Thomas Eichelberger, began growing grapes near York, Pennsylvania. He was so successful that many of his neighbors planted vineyards and York became an early center of grape culture in America. The variety grown was York Madeira, which Prince, the best authority on viticulture at the time, said was the Alexander. Eventually, Isabella and Catawba were widely planted and grew well. These pioneer Pennsylvania grape-growers used their grapes for wine, and very good wine. The temperance wave in the middle of the nineteenth century seems to have killed grape-growing about York, but even to this day some grapes are grown there and farther east into New Jersey for the markets and for home wines.

There is a small but very good grape area about Egg Harbor, New Jersey, where especially good red wines, and some white ones, are being made. This area could be enlarged, as there is an opportunity for the many city people who have country homes in New Jersey to grow grapes and make their own wines. Ives, Eumelan, Clevener, and possibly Norton, might all be grown in New Jersey for red wines, and any of the grapes grown in the East for white wines.

At present, however, the largest vineyards in Pennsylvania are along the shore of Lake Erie, an extension of the Chautauqua Grape Belt to the west across two states into Michigan. The varieties, the methods of training and the whole industry, except about Kelley's Island in Ohio, are the same.

An early center of grapes and wines was in and about Cincinnati, where Nicholas Longworth introduced the Catawba in

1825. Longworth was then one of the wealthiest men in America, but soon retired from business and devoted himself to grape-growing and wine-making. He at first grew European grapes to the number of 1,500 plants, none of which lived longer than two or three years, but Catawba was a success from the start. Longworth became the promoter and distributor of the Catawba along the Ohio, and by 1840 he was making wine in a winery that cost \$60,000. A gift of wine to Longfellow inspired the poem, *Catawba Wine*. In the census of 1859 there were 2,000 acres of Catawbas near Cincinnati.

From 1870 on, grapes were planted less and less along the Ohio, and the wineries went out of business. Climate and soil are conducive to viticulture, on both sides of the river in Ohio, Kentucky, and Indiana, and it only awaits one with Longworth's initiative to start a grape and wine industry in these regions; certainly those living here who want home wines could have them.

The great growth of viticulture which began in the 1860's started in northern Ohio in 1865. By 1870 there were over 10,000 acres of grapes in Ohio along the shores of Lake Erie. In 1889 there were 4,000 acres of grapes in Cuyahoga County alone. But the center of the grape area in northern Ohio was and is on the mainland and the islands near Sandusky, where plantings were first made in the 1850's. The varieties set in Ohio were much the same as in the Chautauqua Grape Belt, with Concord leading and with large plantings of Catawba, Delaware, and Ives in the Sandusky area.

From the start, a good deal of wine has been made in northern Ohio, especially near Sandusky. No better grape lands are found east of the Rocky Mountains. A large proportion of the wines made in the region are sweet wines, quickly made and quickly sold.

LESSER GRAPE REGIONS

There is much land in Michigan in what is known as the Fruit Belt where grapes have long been profitably grown for the table, for grape juice, and some wine. Roughly, good grapes are grown in Michigan in the region extending from Grand Haven on the north to Indiana on the south, inland to Grand Rapids and south

to Kalamazoo. Benton Harbor and Paw Paw are the centers of grape-growing in this rather large area. Probably good grapes could be grown in Michigan wherever the peach is grown.

There are a good many grapes grown in Missouri, the industries of grape-growing and wine-making having been brought to the state by German vintners about the middle of the last century. Grapes seem to thrive best in Missouri in the Missouri River Valley, a center of viticulture, once important, being at Hermann and Boonville. All growers of American grapes are greatly indebted to this region, as can be seen by reading the chapters on varieties, to a dozen or more men, Germans, who, in the last half of the nineteenth century, bred and distributed a hundred or more good grapes, some of them being among our best wine grapes. Another large area of good land and a good climate for grapes is found in the Ozark region of southwestern Missouri. This Ozark land stretches across the state's boundaries into Arkansas and Oklahoma.

The most prominent grape regions east of the Rocky Mountains have been discussed at considerable length, emphasizing again that this fruit, and more especially a good wine, are the products of very particular climates and soils, here as in every other part of the world. It is well to emphasize again, also, that grapes may be grown and wines made, good or bad, in all but three or four states east of the Rockies.

In this discussion, something must be said of the grape lands of the South—the Atlantic States, the Gulf States, Texas, Kentucky, Tennessee, and, more particularly, Virginia.

The grape industry in Virginia is now of small importance. It was, however, most important from 1850 to 1890, after which it lingered along until the state went dry just before Prohibition. It began in 1835 with the introduction of Norton, the best red wine grape grown in the states east of the Rocky Mountains—that is the best when grown in the soil and climate of central Virginia.

Until after the Civil War, grape planting was limited to small vineyards, but beginning in 1865 large plantings of Norton, Catawba, Delaware, and Clinton were put out, mostly for wine-

making. The wine cellars of the Monticello Wine Company at Charlottesville became so noted for its red wines, and the output was so large, that the town became the 'Capitol of the Wine Belt of Virginia.' The census taken in 1879 showed Virginia to be the sixth state in the Union in the production of wine. The year before, the grape-growers of the state organized the Virginia Wine Growers' Association, with branches in the several centers of grape-growing.

By 1900 the grape and wine industries in Virginia were negligible. The two industries failed because of inability to control black-rot and mildew on the vines; unequal quality in the wines; and competition in both grapes and wines from California. The first two of these causes of failure can now be easily overcome, and competition from California need not be too serious, especially in the making of red wines, if Norton and Ives be used.

There are, also, possibilities for wine-making in North Carolina, South Carolina, Georgia, and Texas. The author sees no great prospects for good wine in any of these states from varieties of *Rotundifolia*, but excellent red wines are made from Herbemont, Lenoir, and Norton. It may develop that good wines, red and white, dry and sweet, may be made from Munson's hybrids. There are many suitable soils and climates in all these southern states, and with the varieties now to be had, and others to come, the possibilities of wine-grape production in the South are bright.

WINES IN CALIFORNIA

Everyone in the world who uses wines knows that most of the wines made in America come from California. It would seem, then, that California ought to have been the first wine region discussed in this chapter on American wines. There are several reasons why it is not. First, as has been stated before, this book is chiefly about grapes and wines from native species, and California grows very few varieties of native grapes. And, second, the author confesses that he knows too little about grapes and wines in California to say much about them. There are several hundred

commercial wineries in California, 500 at least, and many grape-growers and city dwellers who make wine in their homes. To round out the subject a few pages are added in the history of wine-making in California, the facts all taken, of course, from California sources.

Grapes were first grown and wines were made in California by the Franciscan missions, the first one of which was established at San Diego in 1769. Under the leadership of Father Junipero Serra, patron saint of agriculture in California, twenty-one missions were founded in the course of a few years from San Diego in the south to Sonoma in the north. The old mission records speak of grapes and wines in all these Franciscan establishments.

The grapes planted at the early missions were brought from Mexico, where at far earlier dates they had been imported from Spain. Sooner or later, a variety called the Mission appeared and was long about the only grape grown on the Pacific Coast. The origin of this grape is not known. At first, it was supposed to be a pure-bred variety of the Old World grape, *Vitis vinifera*, but it has never been identified with any European grape, and, moreover, has characters out of keeping with *V. vinifera*. A good many viticulturists now believe that it is a hybrid between *V. vinifera* and *V. Girdiana*, a wild grape in California.

When California became a state in 1850, Los Angeles was the center of grape-growing and was known as the 'City of Vineyards.' Of the names memorable in grape-growing and wine-making about Los Angeles, that of Colonel Agoston Harazthy leads. In 1856 Harazthy moved to Sonoma and engaged in growing grapes on a still larger scale. Soon after he was commissioned by the governor of California to go to Europe to get information on grape-growing. His report of this visit, embodied in a book, *Grape-culture, Wines and Wine-making*, published in 1862, gave the infant industry of grape-growing a stimulus that soon made it the most important field of horticulture in the new state and wine-making a great industry.

Another result of Harazthy's visit to Europe was the introduc-



PLATE XXIII. A vineyard in the foothills of the Coast Range in Central California



PLATE XXIV. A. A vineyard in Fresno County, California
B. Picking grapes for raisins, Fresno County, California

tion of a large number of European grapes for wine-making, table use, and raisins, of which, at the time, Zinfandel was the most important in wine-making and still remains a leading variety for wines.

Another early patron of viticulture in California was A. Delmas of San José. About 1850, or a little later, Delmas sent to France for grape cuttings, which, packed in boxes, withstood the voyage around Cape Horn so well that out of the lot one hundred varieties were propagated. Vineyards in all parts of California were soon being stocked from the Delmas plantation of fine varieties. Such was the start of grape-growing and wine-making in California.

The state's yield of grapes and wines increased by leaps and bounds after the Civil War. In 1877, Californians could boast that their state in that year produced 4,000,000 gallons of wine. Most of the wine sent out of the state in these early years was not good. Much of it was made from varieties not suited for wine-making; the process of fermentation was not well understood; the wine-makers did not know about, or at least did not practice, aging their products; the wines were not properly or attractively bottled; and practically all of it was sold under European names, thus misleading the wine-drinkers of eastern cities. These early mistakes gave California wines a bad name, which has not yet been lived down; indeed these poor practices have not altogether stopped.

The custom began, in these early years, of exporting wines to France, where it was blended with French wines, or bottled unblended, and reshipped to the United States under French labels. It followed, of course, that unprincipled wine-makers in the Golden State did not bother to have their wares cross the ocean twice to entice American wine-drinkers to buy them, but supplied a French label at home.

Conditions in wine-making became more and more intolerable until in 1880 the better wine-makers invoked the law to help correct the evils of the industry. The State Legislature passed the Pure Wine Law. The enforcement of this law corrected the

graver evils. Wines are no longer colored with aniline dyes; the use of salicylic acid and other unwholesome antiseptic chemicals has stopped; and the amounts of sugar, water, and tannin used in making wines are regulated.

Quite as important as the regulatory laws were those providing for research and the distribution of information in regard to viticulture and wine-making. The University of California was directed to begin research at once in grape-growing and wine-making; and under the direction of Professor E. W. Hilgard the investigations that followed soon put the California wine-industry on a sound basis. The reports of experimental work with grapes and wines published by the University of California soon became the best available information that workers in the industry, the world over, could obtain. Another most helpful agency was the State Board of Viticulture, established to spread information in regard to good practices in growing grapes and making wines, tasks which it has done well.

These small bits of history of wines in California—a large volume would be required to do the subject justice—are given to make plain that, by and large, it is to California that American wine-makers in homes and in wineries must look for help. Since the varieties which makers of wines in the eastern states must use are wholly different from those grown in California, it is not to be expected that the wines will ever be the same. In neither region should the wines ever be labelled with European names; no one of our American wines is the same as any European one, although those of California are more like those made in Europe, since the varieties of grapes are similar.

It is idle to speculate whether eastern or western wines are better. They are wholly different. Most wine-drinkers like the Champagnes made in the East better than those made in California; eastern dry white wines are as good as the western ones; but California red and sweet wines are, on the whole, better. In both regions, if more attention were paid to the selection of good grapes, properly ripened, good methods of making, the use of

comparatively small vats and containers, and longer aging, the wines would be improved. However, though the wines made in American homes and wineries might be better, they are all, as a rule, sound, wholesome, and of good color and flavor. No one needs to apologize for an American-made wine.



16. The Home Winery

FIRST of all, there must be a place in which to make wine. The ideal place is a cool, dry roomy cellar with hot and cold running water, good drainage, and a concrete floor. A room built for the storage of fruits and vegetables makes a good home winery, especially if there is a side-room in which canned goods and preserves are kept, with room enough to store three or four hundred bottles of wine. In the storage-room one ought to be able to control the temperature, keeping it at the sacred 50°-55° F., summer and winter, at which all wines keep best. It may be that the furnace-room, where the temperature can be kept around 65°-70°, will have to be used as the fermenting-room.

The above specifications are for an ideal home winery. Few can approach the ideal; but wine has been made, by hook or crook, in the kitchen, the bath-room, in the laundry, or even in the children's play-room. Those who lived through Prohibition have seen all these places in use.

After having found a room to make and store wine, what equipment will be needed? More than would be suspected, until one gets going, after which one is always lamenting that there is so little. There are several major pieces of equipment that every wine-maker must have.

STEMMERS, CRUSHERS, AND PRESSES

One can be more certain of the product when the grapes are stemmed before crushing. Grape stems contain much tannin, an essential ingredient in all wines. Skins and seeds also contain tannin, and since all red wines are fermented on the crushed grapes,

it is usually better to stem for red wines. White wines, for which the pure juice is fermented, is likely to be deficient in tannin, so for white wines the stems are not removed before crushing and pressing, though some wine-makers remove a part of them.

In commercial wineries, stemming is done by machinery, but in the home one does the work by hand, bunch by bunch. As a cluster is taken from the container, one quickly removes green grapes, spiders, cobwebs, and other refuse, should there be any of these undesirables, and then with a single movement pulls the bunch through the hand, the grapes falling in their receptacle, the stems tossed into another. This stemming by hand, whereby the refuse is all removed, is much better than machine stemming, and is another instance of better work in the home winery, leading to a better wine than is made commercially.

Of crushers, there are many models of several materials to be purchased from mail-order houses, any one of which is about as good as another. In all southern Europe, in home wineries and in some commercial establishments, the grapes are crushed by tramping, as has been done from time immemorial. Some French wine-makers justify the use of feet in crushing grapes by saying it is the only way that the grapes can be crushed without breaking the seeds; they also believe that the slight warmth of feet and legs takes the chill off the juice so that fermentation starts more quickly.

As good a crusher as any is a simple pair of grooved wooden rollers, connected by cogwheels running against each other. The rollers are at the bottom of a wooden hopper, holding about a bushel. In such a crusher few seeds are broken. The bottom of the hopper slopes from two sides to the rollers.

One sees for sale a crusher made on the plan of a sausage grinder, with holes on the underside. At one end is a hopper, while the other end is partly open, through which the 'grape sausage' drops out in the special receptacle, while the juice drips into a barrel or vat. This grinder is turned by a crank, as is the simpler roller crusher. The objection to the 'sausage grinder' is that it is made of metal, and iron, steel, bronze, or copper are

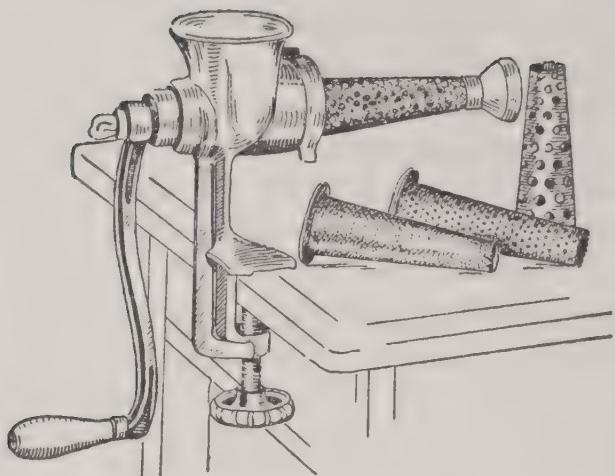


Fig. 32. Showing a grinder-crusher, and press.

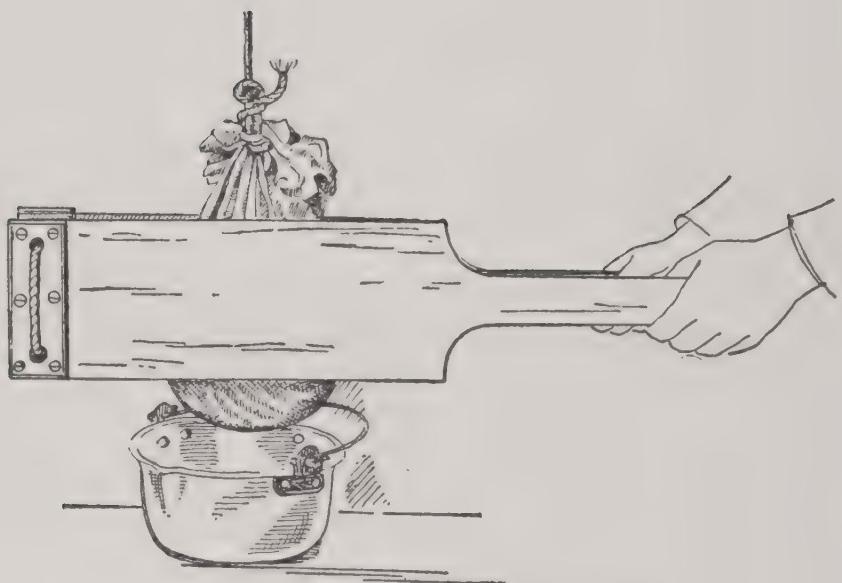


Fig. 33. A hand press of the nutcracker type.

dissolved by grape juice in minute quantities, which, even ten parts to the million, may cause the wine to cloud in its later life. Figure 32 shows a sausage grinder type of crusher and press.

A wine-press is necessary. One might make a gallon of wine in the kitchen, squeezing the grapes by hand and letting the juice drip out of a jelly-bag, but no man could use this makeshift. Better than pressing by hand, a 'nutcracker' press may be used. This press may be made at home from two wooden paddles, as shown in Figure 33. The rope hinge should be long enough so that it may be adjusted to fit the bag.

A good, solid wine- or cider-press is needed. It should be 18 or 20 inches in diameter and as deep or a little deeper. This press should be substantial in all its parts—screw, uprights, press-bed, and the cylinder cage into which the crushed grapes are put. A press so light in structure that it slips or slides, and on which all the pressure of a man's strength cannot be put, is a poor contraption. The old Roman presses shown in ancient illustrations were good models, though the modern press shown in Figure 34 is better.

Hardware stores, the country over, sell such presses, usually as cider-presses. Or, certainly, one can be ordered from the large mail-order houses. In buying, if possible, one should get a press the cage of which comes apart for cleaning. The cloth bags needed in pressing sometimes come with the press; if not, two strong, porous bags must be made.

For a press 18 inches in diameter, the bags must be 2 feet wide, open at one end, and about 25 inches deep. One must make sure that the cloth is strong enough—nothing is more provoking than to have a bag of crushed grapes burst under pressure. A fine grade

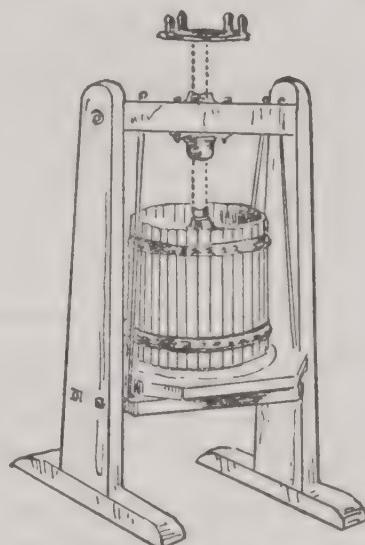


Fig. 34. A screw press.

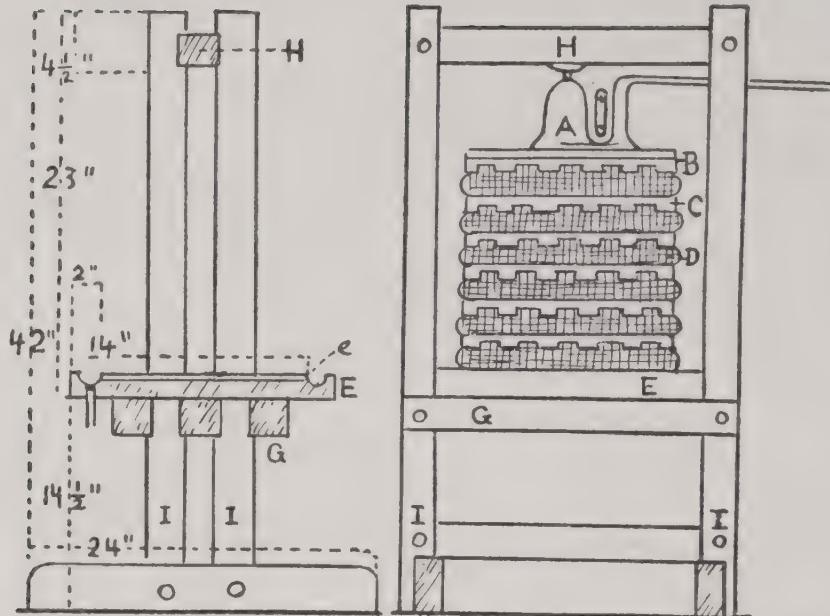


Fig. 35. Construction and Dimensions of Homemade Fruit Juice Press with Approximate Capacity of 1 Bushel of Fruit.

- A, hydraulic jack, capacity $1\frac{1}{2}$ tons, 5-inch lift. A 4×4 inch block 5 inches high should be used in conjunction with the jack to increase the total lift.
- B, flat support for jack, $\frac{3}{4}$ inch oak, 14×14 inches. Six $1 \times \frac{1}{4}$ inch slats are nailed across grain on the lower side.
- C, six racks, oak 14×14 inches, made from $\frac{1}{4} \times 1\frac{1}{2}$ inch and $\frac{1}{4} \times 1$ inch slats. (See Fig. 36.) The wider slats are used at the edges. The center slat may be made 20 inches long so that it may serve as a guide between the uprights I. Corrosion-resistant nails should be used. The racks may be paraffined by warming and brushing on hot paraffin.
- D, press cloths 24×24 inches. Heavy twisted cotton of open weave. White grain sacking or white duck cloth may be used. These may be lined with muslin cloth.
- E, press base. Careful and sturdy construction is most essential to a good press. Hard close grained wood such as maple is desirable. A $\frac{3}{4} - 17$ inch \times 17 inch base has a $\frac{1}{2} \times 2$ inch inside bevelled edge around it. This is securely attached to base support G. A $1\frac{1}{4} - 14$ inch $\times 14$ inch board (e) is placed over the main base and a $\frac{1}{2}$ inch groove is cut around it so that the juice may flow to the outlet F. A smooth surface and a coat of paraffin are desirable.

F, outlet for juice, $\frac{3}{4}$ inch pipe of corrosion-resistant metal.

G, support for press base.

H, press top, a metal plate at point of contact of press is desirable.

I, uprights. Two uprights used on each side to allow more sturdy press base support G and guide for racks C.

J, Cheese form 14×14 inches square, 2 inches high, made with 1 inch board. (See Fig. 36.)

In using this press the grapes should be crushed in a grape crusher. The crushed grapes should be placed in the press immediately. Place cheese form J squarely on press base E. Place press cloth diagonally over the form, the corners to fall down over the sides of the form. Place crushed fruit in cloth. (See Fig. 36.) Fill the corners, i.e., do not round out the form. Fold the corners of the cloth over the fruit, not too tight, remove the form and place a rack C on the cloth. Place cheese form J squarely on rack C and continue until the press is filled. Jack A is placed squarely on support B and pressure is applied uniformly. If twisting occurs, the cheeses have not been built uniformly. When full lift of jack A is used, lower and use a block to obtain additional lift.



FIG. 36. (Left) Filling the press. (Right) The press in operation.

of burlap is very satisfactory; heavy bolting-cloth may be used; or, a porous canvas. Whatever the cloth, the seams must be sewed and resewed with strong thread; even so the bags burst first at the seams.

In using this press, the grapes are crushed, then put in the bag. Pressure from the screw is turned on, and the juice flows through the cloth bag, and between the staves of the barrel into a receptacle below. From the receptacle the juice for white wine is poured into a barrel to ferment; while the new red wine goes into a barrel for its second fermentation.

In a small winery at the New York State Experiment Station at Geneva, a home-made wine press is in use which is easy to use, presses out the juice rapidly, and gives a large yield of juice. Figures 35 and 36 show this press and give directions for its use. Any carpenter can make this press, and the jack can be purchased from most hardware stores, or from mail-order houses. (The illustrations are from Circular 194 of the Geneva Station.)

BARRELS, CASKS, AND VATS

We come now to the most difficult articles to get in equipping a wine-cellar; and, having got them, the most difficult ones to keep in good condition. A generation ago, when there were cooper-shops in every town, when oaks suitable for cooperage could be found in most forests, one could get oaken receptacles of any size for wine-making. Now one gets suitable barrels and casks only after long search, metal, glass, and cement containers having driven the cooper to the wall in nearly every part of the country; and good oak has grown scarcer and scarcer.

All the cooperage in a wine-cellar should, if possible, be made of white oak; no other oak or wood takes its place, though wine-makers in California find redwood acceptable. A new barrel is always better than an old one unless it is one used for wine in your own cellar and has been properly cared for. Instead of trying to find a cooper, it is best to order from a mail-order house, in which case you may take your choice of a plain barrel, or one waxed or charred inside. A plain barrel is best, though some prefer

paraffined barrels. Those charred inside are not for wine, to which they give a dark color. Even in a small cellar one should have three or four barrels holding fifty gallons each, and three or four casks holding fifteen gallons each.

In lieu of the wine-maker's fermenting-vat for red wine, some use a barrel of which the head has been removed. The head should be saved for there are times when it may be used to cover the mash of crushed grapes. Between vintages, the vat should be kept immaculately clean, sweet, and sterile. When new, a vat should be filled for a week or two with water, put in boiling hot, in which a handful of soda has been dissolved. This solution ought to be changed several times; or, better still, soak a day, rinse out with a hose, let dry, and then coat the inside with melted paraffin put on with a clean paint brush. This treatment should be repeated after every vintage.

The vat should stand on a foundation, raising the barrel about 20 inches above the floor, high enough so that a pail can be put under the spigot when the wine is drawn off. A barrel of wine weighs several hundred pounds, to hold which the foundation must be substantial.

It is to be supposed that the wine-containers will be barrels or casks, though many makers of small quantities prefer glass. Barrels and casks require much attention to keep them clean and sterile. Wine made in a barrel in which the inside is moldy is never good, and once the oak staves are filled with the mycelium of mold, it is almost impossible to restore them to pristine sterility.

Perhaps the best way to keep the wooden containers sterile is to 'sulphur' them, an age-old custom in European wine-cellars. In the home wine-cellar this is best done by burning wicks of sulphur in barrel or cask with the bung-hole not tightly closed. Dealers in wine-cellars supplies sell these wicks, but one may make them with little trouble, making enough at one time to last for years.

MINOR EQUIPMENT

It is amazing how many things are needed in the process of making a few barrels of wine. If the work is to be enjoyed, one

must have all of the equipment in a pleasant, roomy cellar. Here let it be said that unless you enjoy every step of the mussy work of making wine, don't try it—buy your wine. The wine-maker is brother to the angler, and 'angling,' as Izaak Walton tells us, 'will prove to be so pleasant that it will prove to be, like virtue, a reward in itself.'

Here is a list of the things a wine-maker must have: crusher, press, barrels, casks, carboys, five gallon jugs, a fermenting vat, sulphur wicks, a flashlight to enable you to see the condition of the inside of a barrel, siphoning hose, two or three funnels, a saccharometer, a thermometer, a floating thermometer, a hydrometer jar, a burette, a little tannic acid, sulphur, gelatin, and paraffin; and of course bottles, corks, a bottling machine, spigots, pipettes, glass rods, faucets, bubble-valves, bung-starters, strainers (at least two pails), a roll of absorbent cotton, and plenty of clean cloths.

If this list seems long and costly, go into partnership with a friend. It is reassuring to remember that convicts make wine, beer, or alcohol without much of any equipment. No doubt it will pay you to go to the house of an Italian laborer and see how he makes wine. And, again, recall how your mother made wine in her kitchen; or, how your father made snappy hard cider in the woodshed. The equipment listed above is for making wine *de luxe*—the very best that can be made—better than any large winery can make, even if it can get the ideal grapes which alone you will use.

Sulphur wicks are made at home out of strips of linen or cotton cloth, an inch wide and 8 or 10 inches long, which are dipped in melted sulphur so that a thick coating is formed on the cloth. In making, keep the liquid sulphur at the lowest temperature at which it will remain liquid; otherwise it will burn. Dip the wick two or three times so that there will be as much sulphur and as little cloth as possible. These wicks may be bought from wine supply houses. Three or four inches will sulphur a barrel—half as much for a cask. The wicks are suspended in a barrel by means of a bung holding a wire several inches long, one end of which is

fastened to the bung, the other turned up to hold a hook upon which the wick is held. A cup attached to the wire under the wick to catch any melted sulphur is almost a necessity, otherwise there will be a daub of sulphur on the lower side of the barrel under the bung.

Immediately after a wine cask has been emptied it should be resulphured—a delay of a few days may mean a ruined vessel. It should be thoroughly washed out with boiling water as soon as the wine is out, and left, with bunghole open, to dry. As soon as it is dry, it is sulphured, after which it should be kept in a dry place. If not used earlier, it should be sulphured a second time in six months.

Sulphuring is out of date in modern wineries; chemicals are used instead, of which metabisulphite is in most common use. One may prefer to sterilize his barrels with sulphur wicks just as millions of fellow wine-makers are doing the world over and have done for ages.

Of course it is possible to eliminate much trouble by using glass, and most makers of wine in very small quantities ought to make and age their wines in glass containers, the chief advantage being that they are easy to keep clean. Still, one likes to think of ‘wine in the wood’; of wine, a living thing, breathing through the pores of oak staves; that he is using, in this respect at least, the process by which the best wines have been made for centuries.

But praise wine in the wood as you will, when the quantity is small, making it in glass is much simpler. As has been said, glass containers are far easier to clean; they are much easier to move about; in glass one sees how fermentation goes, whether the wine is frothy, bubbling, dead, clear, or turbid, and the amount of lees being precipitated; and, all in all, glass containers are much cheaper.

One of the disappointments the tyro suffers in making wine in wood is that the quantity evaporates at an amazing speed, and after a few months he awakens to the fact that he is short two or three gallons and as likely as not has no surplus store from which to fill the barrel. Worse still, he soon finds that in these unfilled

containers his wine is changing to vinegar, a change once begun not to be stopped. There is little evaporation from glass containers.

A five-gallon glass jug is about the smallest glass receptacle one can profitably use. Very much better is a twelve gallon glass carboy, such as a druggist keeps sulphuric acid and other corrosive liquids in. It is possible to pick up carboys one by one until as many are acquired as are needed. Usually these vessels come in wicker or wood, which should be removed as a source of dirt.

You are wondering how you can get the wine in and out without endangering the relatively fragile glass. Nothing is easier. Keep on hand two or three lengths of half-inch hose with which you can siphon grape juice in and wine out. Even if one prefers wood—as most experienced wine-makers do—a few carboys and five-gallon glass jugs are most convenient to have.

BOTTLES, CORKS, CORKING-MACHINES, AND CORKSCREWS

We come now to the last but by no means the least of the items that will be needed in making wine. The trade usually sells white, green, or brown bottles for white wine, and dark green ones for red wines. The bottoms of bottles of dry wines are usually strongly indented, or 'kicked,' while sweet wines usually come in flat-bottoms. Dry white wines are most often put in tall slender bottles, most beautiful to look at and handle. One need not be particular in the home winery as to the bottle he uses, just so wine-bottles are always used. A wine-bottle is so pleasing to look at that it promises satisfaction to palate and nostrils as well as sight.

The size of the bottle makes a good deal of difference in buying—whether five or six quarts to the gallon, or did until very lately when it became compulsory to put the number of ounces or other statement of quantity on the bottle. But, pints and quarts are still a moveable-feast, companions in the trade, and one needs to have a look at the fine print statement of contents when he buys. Of course the dent or 'kick,' as the English call it, curtails the quantity by at least a glass in most bottles.

For a small family, at least 50 per cent of the wines, red or white, sweet or dry, should go in pint bottles. One often wants to drink

more than one kind of wine at a meal, and dry wines begin to go off taste if uncorked more than twenty-four hours. Nor does one want to have too many open bottles of sweet wine standing about. To be sure, one must remember that wines in pints do not reach the perfection of those in quart bottles, though it is supposed that wines in pint bottles mature rather more quickly than those in larger sizes.

Of course, one may have wines in larger than quart bottles—usually multiples of quarts. Of these, as generally accepted, are the rehoboam or imperial eight quarts; the jeroboam, six quarts; the double magnum, four quarts; the magnum, two quarts; after which come the common quart, the pint, and the half pint, often called the 'imp' or the 'baby.'

The scarcity and high cost of good corks in wartime have brought several substitutes. Some bottles are capped as are ginger ale containers; screw caps are used on many bottles and glass jugs. These metal caps are cheap and very convenient, and no doubt have come to stay, for cheap wines at least. Can metal take the place of cork? It cannot for those long accustomed to corks. This is not wholly sentiment. Wine, in the course of months and years, breathes through the cork, and it is very doubtful whether it will age in the bottle as well under a metal top as under a cork.

A good cork for a quart bottle is an inch and a half long, straight, and solid throughout. Such a cork must be put in by mechanical cokers. A simple, wooden coker, of the plunger-type, will do for a small number of bottles, but they must be hammered down with a mallet, which often fails to put the cork in far enough, and every now and then a bottle breaks, or a piece is chipped out of the top of the neck. A good corking machine can be purchased for a few dollars and does a better job than the small wooden utensil.

The bottle should be filled up to an inch of the cork; if too close, the cork may be forced out. Always the cork should be flush with the top of the bottle. In whatever way the cork is put in it must be compressed, before which it must be softened by boiling

ten or fifteen minutes. This boiling also sterilizes the cork, thus eliminating another source of spoilage.

The wine may be drawn from the barrel by faucet or siphon, of which the latter is the better method. It goes without saying that the bottles must be clean and sweet. If there is sediment in the bottle, it is easily removed by rinsing with boiling water in which is an ounce or two of small shot, to be shaken about as the washing proceeds.

17. On Making Wine

THERE are no great mysteries in wine-making. Like bread, cheese, vinegar, and beer, wine is essentially a result of fermentation—the fermented juice of grapes. The yeasts upon which fermentation of these several products depend, to be sure, may be and usually are quite different organisms. To make good wine requires a little more skill, much more time, and a more careful regulation of air and temperature, than to make the other aliments named. Unwanted yeasts must be kept out and cleanliness is a prime requisite. It is much easier to make wine and beer than whiskey, brandy, rum, or gin, since these last beverages are not only fermented but must be distilled as well.

Good wine is dependent on several conditions of the raw material. The most important thing in making wine is the right variety of grapes for the wine wanted. Even if the right variety is at hand, the product may fall short of expectations if the grapes have not been grown in climates and soils which bring out their best qualities for wine. The degree of maturity is very important; the grapes must be ripe enough to have a high sugar content; and, for most varieties of American grapes, a low percentage of acids. In making wine from home-grown grapes, it is even worth while to take time to pick out unripe grapes.

Several minor conditions of the raw material are worth mentioning. The grapes must be clean, though they should not be washed. They must be free from decayed berries and moldy ones, since either might ruin proper fermentation, or, at least, give the finished wine an off flavor. The grapes should be crushed as soon as possible after picking; if they cannot be crushed and pressed at once, they should be stored in a cool room, so that fermentation

is less likely to start. And, of course, to avoid some of the troubles just named, care should be taken in picking and handling not to crush the berries.

The best wines come from vineyards in which yield per acre is not high. A vineyard which holds high records for yields, either because of a rich soil or because coaxed to yield, seldom has an equally high record for its wines. So, too, in the ancient and honorable art of making wine in the Old World, it has been found that the best grapes for wine come from old vines. Vines seem to need old age if the fruit is to carry all the sugars, flavors, esters, and aromas requisite in making a good wine. A vine must leaf, blossom, and ripen its crop many years in succession before it comes to its best estate for the wine-maker.

SUGAR CONTENT

The grapes having been stemmed and pressed, as discussed in the preceding chapter, we are ready to start the process of fermentation. The first operation is one which makes sure that the sugar content is sufficiently high.

Some grapes have too little sugar, even when the grapes are dead ripe. Grapes grown east of the Rocky Mountains, especially varieties of native species, as often as not do not contain enough sugar to make a good wine when every circumstance is propitious and practically never have a sugar content too high to make a dry wine; on the other hand, in California the varieties of *Vitis vinifera* almost all have quite enough sugar and may be embarrassingly rich in saccharine solids for dry wines.

A main item in the long list of utensils necessary to make wine without fear of failure is a *saccharometer*, an instrument by which one determines how much sugar there is in grape juice. It is an inexpensive instrument, of which there are several kinds, to be purchased for a dollar or thereabout from any dealer in laboratory wares of a scientific nature—a druggist may have or can get the implement. Besides the saccharometer, a glass cylinder and a floating thermometer are needed.

These tools in hand, determining how much sugar there is in a

sample of grape juice is simplicity itself. An average sample of freshly pressed juice is poured into the cylinder, after which the temperature is taken with the thermometer. If the temperature is not lower than 50° F., nor higher than 75°, proceed with the saccharometer. Float this instrument in the juice, keeping it free from the sides of the cylinder. If the reading shows a sugar content between 21 and 25 per cent, well and good; if it is lower, granulated sugar is added to bring the reading up to the desired percentage. (Other soluble substances in grape juice cause saccharometers to read too high, so that a truer measure of the sugar present is obtained if 2° is subtracted from the reading.)

Very often, and quite rightly, the grape-grower uses a saccharometer to tell him if his grapes are ripe enough to pick. If a trial test shows too low a percentage of sugar, the crop should be left a few days, if the season permits, for a second, or, it may be, a third test.

The ideal reading for grapes grown east of the Rocky Mountains is 22 and if it runs a little higher no great harm results; adding sugar, it must be understood, is a somewhat regrettable expedient, and as little as possible should be used to bring the wine up to the alcoholic content wanted. How much and how added?

Roughly, if the amount of sugar in the juice is divided by 2, one gets the amount of alcohol in the finished wine, though always a little less since there is some loss by evaporation. All will agree that a dry table wine containing from 10 to 12 per cent is quite alcoholic enough; sugar should be added only to insure this strength. To be sure, if one wants more alcohol, add more sugar. In theory, one should be able to make a wine with 16 per cent of alcohol, but in practice, he can seldom get more than 13 per cent, at which point the yeast organisms are killed. If there is an excess of unfermented sugar the wine is on the sweet side rather than the dry. Roughly, $3\frac{1}{2}$ pounds of cane sugar must be added to 40 gallons of juice to bring the sugar content up one degree. If the sugar content is too high, on no account add water to lessen the sweetness; rather, add grape juice less sweet.

Sugar is best added by making a saturated solution of juice that has been gently warmed. The juice should be thoroughly stirred after the sugar solution has been put in so that it is evenly distributed; after this another test should be made with the saccharometer to make sure that the sugar content is precisely what is wanted.

THE ACID CONTENT

Commercial wine-makers must know about the acid content of the unfermented juice. Nearly all native grapes are quite satisfactorily acid when fully ripe, so that home wine-makers seldom bother about correcting acidity in the unfermented juice. If the young wine is too acid, in most cases the excess disappears as the wine ages, being precipitated as cream of tartar. Formerly it was the custom to ameliorate the grape juice by putting in water. Some commercial wine-makers still use water to lessen acidity, or, it may be, to stretch the quantity of juice. Such an adulteration cannot but fail to make a less wholesome wine, and no vintner having regard for highest quality will put water in the unfermented juice, or, worse still, in the new wine.

Suppose the must is deficient in acid. What then? One outcome is the wine tastes flat; another is, that it does not keep well. The makers of wine in southern Europe have for ages corrected a deficiency in acid by adding plaster of Paris when the grapes are crushed. In European countries the use of this chemical was formerly very common, not only to increase the acidity but because it was thought 'plastered' wines were of better color, kept longer, improved in taste; and, by the abstraction of water, the amount of alcohol was increased. These good results were supposed to follow because the plaster precipitated albuminous matter. Be that as it may, plastering, in Europe or America, is now regulated by law, as is adding water or sugar to must—so much and no more is permitted in commercial wines.

Plaster added introduces undesirable ingredients, and a better way of treating wines lacking acid is to blend them with more acid ones, of which, in eastern America, at least, there are many. Some

wine-makers add tartaric acid in amounts sufficient to correct the natural deficiency.

When is wine deficient in acid? Commercial wineries regulate the acid content of must rather closely. They consider a must having less than 8 grams to the liter as lacking in acid; more than 12 grams, as being too acid. These professional wine-makers test their must by titration, a test the home wine-maker can make without much trouble.

Titration is a chemical process in which a measured amount of one liquid is added to a known volume of another till a definite effect, usually a change in color of litmus paper, is observed. Thus, the strength of an acid solution is measured by adding an alkaline one until a test with litmus paper indicates a neutral point. The instruments needed in wine-making are a graduated glass cylinder, with a stop-cork to regulate the outgo of liquid. This cylinder is called a *burette* and can be purchased from any dealer in chemical supplies. A common chemist's *pipette* and a *glass rod* are also needed. Other supplies are red and blue *litmus paper* and a liter of *sodium hydroxide*. The whole outfit for titration ought not to cost more than a dollar.

The sodium hydroxide should be of 0.1, or normal strength, as prepared by a chemist or druggist.

Tools in hand, titration proceeds as follows: With the pipette (which, by the way, is a graduated, narrow glass tube into which liquid is drawn by suction and held there by closing the upper end) draw up 10 cc. of grape juice and put it in a common cup or saucer. Pour into the burette sodium hydroxide, filling the cylinder to the zero mark. Now let the solution in the burette run into the grape juice, a little at a time, and stir with the glass rod. Test the combined liquids by touching the litmus paper, both red and blue, with the glass rod, after dipping in the grape juice. Eventually the damp rod will fail to turn the blue paper red, and but faintly turns the red paper blue; these are the colors indicating neutrality, upon which the test depends.

Presumably the average man making wine in his home does not care to go very deeply into either chemistry or mathematics.

He may take a chemist's word that with the alkaline solution of the strength given, he may read from the burette the number of cubic centimeters used and thereby know at once the acidity of his must in grams. Cubic centimeters of 0.1 normal sodium hydroxide times 0.75 gives grams of tartaric acid per liter of grape juice.

To bring the acid content of the must to the amount wanted, add 7.56 grams of pure tartaric acid to each gallon of must. (This equals 2 gr. per liter, there being 3.78 liters to the gallon.) In adding the tartaric acid, dissolve it in a little warm water and stir in the must until the whole is thoroughly mixed. Do not dissolve this acid in a metal container, as it attacks metals—use glass or porcelain. This addition of tartaric acid is far better than plastering to increase acidity, since it adds nothing to the must not found in the grapes.

ALCOHOLIC FERMENTATION

The wine-maker's chief work is to provide favorable conditions for countless millions of microscopic organisms whose function it is to turn sugar into alcohol, carbonic acid, gas, and infinitesimal quantities of other substances, of which glycerine is possibly the most familiar. Alcohol and carbonic acid gas are made by the microscopic yeast cells in nearly equal parts; the gas, however, escapes in bubbles, the effervescence of fermentation. To the wine-maker, fermentation is evident to sight, taste, and smell. The gratification of these three senses, as fermentation begins a few hours after pressing, is one of the delights of wine-making. It is most distressing to have the must still and quiet as water day after day, or to have only partial ebullition, conditions indicating that the wine is 'stuck.'

The organisms which cause fermentation attach themselves to the outside of the grape, as the maturing process takes place and are not to be found in the juice until the fruits are crushed, after which every cell multiplies by division and the immense army of organisms attack the sugar in the juice.

One likes to think that the yeast cells on the skin of the grape are a part of the delicate bloom that covers nearly all grapes.

associated more or less closely with the special scented substance which gives the pleasant perfume which spreads from the vineyard over the countryside. To be sure, however, besides these desirable yeast cells on the skins of grapes, there are always a number of other kinds of microscopic organisms, most of which are in no way desirable, so that wine-makers must make sure that the true wine-yeast cells have the right of way when fermentation starts, so that they may overpower the organisms hostile to wine-making. In particular, the hostilities between wine yeasts and vinegar yeasts begin at the start and keep up their warfare until the wine is safely on the table of the consumer.

Wine yeasts belong to the genus *Saccharomyces*, distinguished as unicellular fungi, and by the facility by which they reproduce by *gemmation*, or multiplication by buds, rather than by seed-like spores. There are a great number of species of these *Saccharomyces*, many of which have been isolated and are perpetuated in cultures and are used, as we shall see, as 'starters' by wine-makers.

Perhaps it is well to say in a few words that the yeast cells do not of themselves turn sugar into alcohol. Actually, they produce enzymes, complex chemical ferments, by which the change from sugar to alcohol is made. This statement helps to show, very inadequately, however, what a complicated business wine-making is when the work of yeast cells is added to that of man.

Let it now be said that for the purposes of this text we shall speak of fermentation as though it were caused directly by the yeasts of the genus *Saccharomyces*, or still more simply as 'wine fermentation.'

About all man can do to aid yeast cells to change grape juice into wine is to furnish them with favorable conditions in which to work. When fermentation is over there is nothing further to be done, other than to keep the wine in an environment best suited to bring it to maturity. The best wines have ever been and probably ever will be natural products. Some wine-makers believe that the chemist can add to or take from grape juice this component or that and so alter its character that a better wine is the result.

There can be no greater fallacy. The less chemistry the makers of wine use, especially in the home winery, the better the wine. A change in the sugar content, a modification of the acidity of the must, and the fortification of sweet wines with brandy is quite as far as one can well interfere with the delicate work of the yeasts that bring about alcoholic fermentation.

ENCOURAGING ALCOHOLIC FERMENTATION

When grapes are ripe and clean, the juice, under favorable conditions, supports wine yeasts rather better than it does other organisms. Given the right conditions, these yeasts begin at once to grow and reproduce in countless numbers in a vat of crushed grapes from which red wine is to be made; or, in a barrel of pure grape juice ready to ferment into a white wine. What are the conditions that encourage the maximum multiplication of wine yeasts?

Probably the most important favorable condition is a proper temperature. Extremes of cold or heat paralyse desirable wine ferments, at least temporarily. Wine yeasts do their best work at a temperature between 70° and 80° F. While they may reproduce more rapidly at a slightly higher temperature, the results, with native grapes at least, are not good at 85° F., and wine yeasts become progressively more and more lazy until at 104°, or thereabouts, they are quickly killed. The several species and many varieties of wine yeasts, however, may be affected quite differently by temperature.

Most of the yeasts harmful to wines multiply and thrive best in the higher temperatures at which good ferments begin to lag in their work. The wine-maker, therefore, must see to it that the fermenting juices are kept at the temperature in which the particular species of *Saccharomyces* in his wines can exert their maximum energics. At temperatures lower than specified for good fermentation, the change from sugar into alcohol is slow and incomplete.

From start to finish in wine-making fermentation, one must be on guard in this delicate matter of temperature. A few hours of

too high or too low temperature may ruin the season's vintage. In violent fermentations, when good yeasts are most active, heat is generated as in the fevers of humans. Therefore, it is a good plan to take the temperature of the wine and enter the reading on a chart, much as nurses do in a hospital. Only by such care can one be sure of how his fermentations are going.

In cold climates, late in the season, and when the wine-making goes on in a cool room, it may be necessary at the start to supply a little heat. Or, on the other hand, in warm climates, the must ferments better if it is cooled. Commercial wine-makers are equipped with heating and cooling apparatus whereby the must is kept at ideal temperatures for fermentation.

In the home winery, possibly the simplest method of changing the temperature from poor to good is to suspend a pail of warm water in the fermenting vat to raise the temperature, or of cold water to lower it. As has been said, the European champions of treading grapes to crush them believe that the warmth of the feet and legs supply sufficient heat to start fermentation. In Spain, the stomach and bowels of a calf, sheep, or pig just killed are hung in the must to supply a little heat and to give a flavor which is greatly liked by Spanish peasants.

The second most important means of encouraging fermentation is to regulate the supply of air. Wine yeasts multiply most rapidly and do their work best in the presence of a generous supply of air. Paradoxically enough, however, when the yeast cells have an abundance of air they reproduce exceedingly rapidly but fail to make the maximum amount of alcohol; when the supply of air is curtailed, reproduction goes on relatively slowly but the quantity of alcohol is increased. Here is another delicate balance to maintain in wine-making. In this respect, as in war, a good motto is 'be bold, but not too bold.' As in warfare, too, it is a good plan to take the offensive at the very start. In the matter of air, as in that of temperature, a favorable start enables good yeasts to overpower the bad ones.

How take the offensive? In a small home winery the first blow is best made by dipping a pailful of the fermenting must out of

vat or barrel and pouring it back, repeating several times in the first few hours or in the course of the day. Those who do not stem, or but partially stem in making red wines, believe the presence of the stems helps to keep up the supply of air. Here, too, is another justification by Europeans of crushing grapes by treading; as the treaders lift their feet and legs they aerate every part of the must.

The amount of acidity in the must is important in fermentation. Wine yeasts multiply best and perform their function best in a fairly high acid content in grape juice, while deleterious yeasts sicken and die in any but a neutral must, or one that is barely acid. So, quite apart from its favorable influence on the flavor and aroma of the future wine, acidity exercises a very favorable influence on fermentation.

There still remains a most important means of encouraging good wine yeasts. When the season is poor or the environment of the fermentation vats is not quite up to the mark, the wine-maker can add starters of active ferments of good yeasts to defeat the army of bad ones, which, should they gain ascendancy, would cause muddy, oily, ill-tasting, and poor-keeping wines. In commercial wineries, these starters are now universally used and it is not difficult and is often desirable to use them in home wineries.

There are two ways of obtaining a good starter. The most certain way is to obtain a culture from your state experiment station, if, as is the case in most states, pure yeast cultures for all the many uses to which yeasts are put are kept in a type culture collection. If your state station does not maintain such a collection, the bacteriologist of the institution can tell you of commercial dealers in yeast cultures. Directions for making and using starters come with the cultures.

Each wine yeast, quite in the manner of higher plants, has characters of its own. Some withstand higher or lower temperatures than others; some make a more violent fermentation; some are longer or shorter lived; and, most important of all, each may give a wine a distinct flavor and aroma. A commercial wine-maker prizes his cultures highly and does his best to keep them pure.

If the maker of wines has the use of a fairly high-powered microscope, he will take pleasure in seeing how yeast plants grow. Life goes on in these tiny plants through asexual reproduction. Under the microscope, one sees a cell grow to full size, form a protuberance, a bud so to speak, which remains attached to the parent, so that a compound organism comes into being forming a colony of yeast cells. Different species and strains of *Saccharomyces* go through this process of gemmation or vegetative reproduction each in its own particular size of cell and colony.

If the maker of wines is mathematically inclined, he can calculate how many of these tiny cells are helping him. For each yeast cell at the beginning there will be at the end of a minute, two; in two minutes, four; in three minutes, eight; in five minutes, thirty-two; in ten minutes, 1,024; in fifteen minutes, 32,768; in a few hours, billions.

In case one does not care to bother with starters made from commercial cultures, he can still find means of making sure of a good start in his fermentations. In the days of the Fourteenth Amendment, the starters were of one's own making, and very satisfactory they were. The process was as follows: Just before the crop was harvested for wine-making, a tray of the ripest, cleanest grapes in the vineyard were brought to the fermenting-room. They were crushed and pressed and given the exact temperature needed for ideal wine-making. By the time the full vintage was in the vats the yeast in this preliminary sample was multiplying by millions—a starter ideal in every respect. This, then, was for a wine-maker his own breed of bacteria, and made for him a wine quite as distinctive as any of the famous wines of the world-renowned chateaux.

In these days when so much of our food and drink is pasteurized, every reader must have wondered if it is not practical to kill deleterious yeasts in the juice of the grape in preparation for fermentation. It is and in large commercial wineries it is quite customary to pasteurize the must so that all yeasts, good or bad, are killed. After this, a starter is put in and a fermentation wholly to the liking of the vintner is set going at once. Pasteurization, how-

ever, requires rather costly equipment; and, if the must is heated too much, which not infrequently happens, the wine has an off taste which even aging may not remove.

There is another method of killing or checking undesirable yeasts, so time-honored by usage that all may use it with certainty of success, whether in the largest or the smallest of wineries. This second method is the use of sulphur dioxide or metabisulphite, SO_2 ; or by *sulphuring* the must whereby the sulphur dioxide is added to the must. On a page in an earlier chapter the sulphur wick and the manner of using it has been described. This sulphur wick is the best way of putting sulphur dioxide in the wines in the home winery. It is a simple process, and yet some precautions must be taken to make sure that no sulphur falls or sublimes in the cask, in which case the yeasts of fermentation may change it into hydrogen sulphide, H_2S , the chemical with a rotten-egg odor and flavor, so beloved by college pranksters who have learned a little chemistry.

The precautions are to sulphur as lightly as possible and yet have the cask or barrel fairly well filled with the gas; and to have underneath the wick a small receptacle to catch the melted sulphur should any drop from the burning wick. It is understood, of course, that the sulphuring is done just before the must is put in the barrel, to be absorbed as the vessel is filled.

To conclude this matter of sulphuring, let it be said that, by and large, it is one of the most important operations in a home winery. It is a sovereign remedy for many of the ills of wines; it is almost a necessity in making crystal-bright white wines and candle-bright red ones; it is a pick-me-up to improve the taste of wines that are a little off in flavor; a sulphured wine will usually keep longer; and it is a standard way, in small wineries at least, of keeping barrels and casks sterile.

WINES CLASSIFIED

Perhaps most persons classify wines as *white* and *red*, short, significant terms which all understand. Yet there are so many

gradations in each of these two colors that it is sometimes difficult to tell where one begins and the other leaves off.

Red wines run through every shade and hue of redness from inky purple to light rose and from the rose color quickly passes into white. The color of a European Burgundy or a Claret, as is that of an American wine from Clinton, Ives, or Norton, is a true red; but wines fermented on the skins of Delaware, Catawba, Diana, or Iona are a beautiful rose color. And, of course, many red wines lose color as they age, and become tawny, having thrown down highly colored sediment to the sides of the cask.

There are about as many gradations in white as in red wines. Some are as colorless as pure water. Others take a turn toward yellow, green, gold, or amber. The juice of the Delaware, naturally fermented, has a slight tinge of green; of Iona, or Diana, a tint of rose; of Catawba, a suggestion of bleached straw. To be sure, wine from all these grapes, and any other sorts from which white wines are made, vary somewhat in color, depending on degree of ripeness of the grapes, the soil, or the method of making. But when all is said, white wines are white, and red wines are red, in most of the wines of the world.

Either red wines or white wines are readily and clearly divided into *dry wines* and *sweet wines*. A dry wine is one in which all the sugar, through fermentation, has passed into alcohol and carbonic acid gas, the gas passing into the air, except in the case of sparkling wines. A sweet wine is one in which the sugar is not all fermented out. Fermentation ceases when the amount of alcohol reaches less than fifteen per cent by volume. When the juice contains enough sugar to form this amount of alcohol, with an excess of sugar, it is naturally sweet; or, fermentation is stopped artificially, by the addition of grape brandy, to keep the wine sweet. Thus it is seen that sweet wines, contrary to the opinion of many not wine wise, are more alcoholic than dry wines.

Wine drinkers, the world over, are chiefly users of dry wines, which for the most part they drink with their food. Dry wines are the *light wines* of common parlance. To be sure, sweet wines have their place, though there are those who scorn all wines not

wholly or nearly dry. These sweet wines are more expensive than dry wines, and are, of course, usually used in smaller quantities, serving sometimes as appetizers, but more often and far better as liqueurs at the close of the meal, or in place of tea for afternoon refreshments.

If drunk freely, sweet wines quickly cloy the appetite, though the English manage to drink enormous quantities of Port! One recalls that in the lifetime of Samuel Johnson there were Englishmen who drank three bottles in an evening, the 'three-bottle men' of literature. Dr. Johnson expressed the sentiment: 'Claret is the liquor for boys, Port for men; but he who aspires to be a hero must drink brandy.' The cool, damp climate of the British Isles is conducive to the drinking of sweet wines and Ports and Sherries in Great Britain have ever been favorites.

There is another general category into which all wines fall. Wines, red or white, are either *still* or *sparkling*. The sparkle in sparkling wines comes from the escape of bubbles of carbonic-acid gas. When sparkling wines are mentioned, one's mind turns at once to Champagne, the effervescent wine made in the old province of Champagne in northeastern France, chiefly about the city of Reims. Champagne is usually rated as a dry wine, though there are different degrees of sweetness. Of this there is to be a fuller discussion in the chapter on making sparkling wines.

Less well known, and deservedly so, is sparkling Burgundy, a wine the popularity of which is chiefly found in the United States. Few reputable French wine-makers make sparkling Burgundy; few good French restaurants serve it; and no connoisseurs of French wines praise it. For no time and for no place is sparkling Burgundy comparable to Champagne. As often as not, the red wine from which sparkling Burgundy is made is not Burgundy; at its very best, it is far inferior to still Burgundy, one of the noblest of all wines. There are, as will be seen in a later chapter, several other sparkling wines of greater or less renown.

18. On Making Red Wines

If a poll could be taken of the wine drinkers of the world—sending the questionnaire only to epicures—robust Burgundy would be voted the King of all wines, and the more delicate Claret the Queen. Without any doubt whatsoever, a poll would show that the majority of wine lovers, the world over, like red wines, dry or sweet, better than white ones. Even though no poll has been taken, it is common knowledge that Burgundy, Claret, and Port are the world's favorite wines, and, naturally enough, every man who makes a red wine in America would like to label his product Burgundy, Claret, or Port, even though, whether amateur or commercial wine-maker, he knows in his heart of hearts that to so label them is a fraud patent to all.

GRAPES FOR RED WINES

What names shall we who make wines in our homes give our wines? Certainly none of us will be foolish enough to use the names of great European wines. What we want is a label for every distinct wine we make, with a name for the wine, the name of the maker, and the vintage year. The label should tell exactly what the wine is: *Dry Norton, Sweet Norton, Dry Ives, Sweet Ives, Dry Eumelan, Sweet Eumelan*; and so on through the red and white wines in one's cellar. A difficulty with this method of naming is that many wines are blends. In this case use the name of the grape that predominates, as one always does. This brings us to the names of red wines that might well appear on bottles of native wines.

In the author's opinion, Norton is the best native grape for red wines, but it does not ripen often north of Maryland. Ives is the

second best, with Clevener a close third; both of which grow well in many northern vineyards. Eumelan is an especially good grape for red wines, but is partially self-sterile and therefore not a favorite in the vineyard. No doubt Clinton is the easiest grown in the North, but its wines are harsh and sour until well aged. It is a good wine for blending with any of the preceding wines. Then, for the far South, there are Herbemont and Lenoir, both of which make beautiful and very good ruby-red wines. A wine of sorts can be made out of Flowers and James, black Rotundifolias of the far South.

All these varieties, as well as several others more or less used for red wines, are described in Chapter 14. Take notice that Concord and all its seedlings and near of kin are left out, for the reason that wines made from them are hardly fit to drink. It may be difficult to find some of the varieties named; but, on the other hand, new grapes are being introduced which may make good red wines, so there is no lack of red wine grapes.

In a manuscript sent me by Mr. Philip W. Wagner, author of two of our best books on American grapes and wines, 22 wines from native grapes, some of them new hybrids, were discussed, of which 5 Seibel seedlings stand out prominently. The first two and last two paragraphs in Mr. Wagner's excellent discussion are well worth quoting:

On Saturday, May 9th, we held a tasting of wines at our home, Boordy Vineyard, Riderwood, Maryland. In all, twenty-two wines were tasted by a group of fifteen people, all of whom are interested in American-grape-growing and wine-making. All, furthermore, have a good general knowledge of wines, based mainly on the European kinds.

Of the twenty-two wines, all but six were made in September, 1941, and were thus approximately eight months old. Nearly all of the wines were made of hybrid grapes which have never been used before for wine-making in the United States, many of them being French hybrids grown to a considerable extent in Europe but not grown commercially in this country, though they can be.

In conclusion, one thing stands out clearly. If eastern red wines are generally looked down upon by competent judges and the general public (and they are) it is mainly because eastern wine-

men and grape-growers have failed to explore the possibilities of growing better grapes. Some of the red wines in this list, notably Seibel 6339, Baco, Seibel 1XX, and Seibel 5898, were a revelation to all of us. The grapes from which they were made had ample sugar, low acid, excellent color, and all the other elements necessary to a 'balanced' table wine. When grown under proper circumstances, these grapes clearly require no 'adjustment' when made into wine, handle with ease, and yield wines far superior to those red wines from the ordinary eastern grapes. To these should be added Seibel 1000, which is now being grown in a limited way in New York State.

And the most interesting point of all is that, with these few hybrids, we have only begun to touch the surface. In France the breeding of hybrids for both red and white wines has gone on for a long time. Until we have obtained, propagated, and thoroughly tested the very best of all these, we cannot pretend to know what the real wine-making possibilities of the United States east of the Rockies are. Here at Boordy Vineyard we intend to keep on experimenting with this interesting group of grape varieties. As some of our other varieties come into bearing we expect to hold other wine testings. Next Spring, in addition to some new things, we hope to run again through the wines here discussed, to see what another year of development does for them and to give us a better basis for judgement in the future.

(Signed) J. & P. WAGNER

Several good red wine grapes from California can usually be found in the cities of the East, any of which might be used to blend with home-grown varieties. The best of these are Alicante Bouschet, Carignane, Petite Syrah, Pinot Noir, and Zinfandel. Of these Petite Syrah, Pinot Noir, and Zinfandel can be grown on grafted stocks in eastern America with some show of success—at least two crops out of three—in soils and climates where Catawba is now grown. All have been grown on the grounds of the New York Experiment Station, at Geneva, thriving as well as Catawba as grown there. A little more certain than any of these at Geneva are Blauer Portugieser, and Cinsaut; though the splendid red wine grapes Petite Syrah, Pinot Noir, and Zinfandel have all made a very good showing.

ON MAKING DRY RED WINES

The wine-maker must take account of the constituents of unfermented grape juice—a knowledge much more important to the makers of red wines than of white ones, since the whole grape and, possibly, its stem go in the fermenting vat.

A cluster of grapes consists of a main stem, with stemlets, or pedicels, to which are attached the grape berries. The parts of the grape berries in which the wine-maker is interested are skin, pulp, and seeds. First, let us consider the stems.

The stems contain considerable quantities of tannin, a strongly astringent acid indispensable in all wines. Besides tannin there are other acids in the grape berries. These acids, taken together, may give red wines a sour and bitter taste if all the stems are put with the crushed grapes in the fermenting vats, or if they are left too long in the must during fermentation. There is some tannin in unfermented must but much more when alcohol has been formed to extract it from seeds or stems. Tannin is water-soluble as well as alcohol-soluble.

The skins of the grape berries are most important in making red wines, because from them come most of the coloring matter, as well as some tannin and other acids. It is a surprise to find that a red wine cannot be made from dark-colored raisins, the reason being that the coloring matter is oxidized in the drying process, so that raisin wine is colorless.

The skin is the lodging place of most of the perfumes which make cultivated grapes so agreeable, though in the varieties of Labrusca, as represented by Concord and Niagara, it is a rank, unpleasant scent. Few of the delicate perfumes which give grapes in general their charm linger long in the wines, although the foxy smell of the Labruscas takes years to wear off, if ever, except in sweet wines. The fruity scent found in the skins of grapes has little to do with the formation of the bouquet in wines which develops later.

The pulp of a grape is the reservoir which contains the juice to be fermented into wine—thus the pulp is the flesh and blood of

the grape. Both flesh and blood are exceedingly variable in composition, so much so that the chemists' analyses so often given mean little so far as quantities are concerned. Roughly, 75 to 80 per cent of the pulp is water; 15 to 20 per cent, grape sugar; there are several free acids, chiefly tartaric and malic, but no tannin in flesh or juice; of bitartrate of potassium there is rather less than 1 per cent; then follow small percentages of mineral and albuminous substances and essential oils.

A few grapes are seedless—but rarely the sorts used for wines; most wine grapes are weighty with seeds wrapped up in flesh and blood. The seeds of our native species are exceedingly variable in size and weight. Large or small, they contribute little to wine unless broken in crushing, in which case their constituents may spoil an otherwise good wine. The deleterious substance in seeds is an astringent, resinous substance. Besides this resin, there is an abundance of tannin (in some seeds 10 per cent), acids, oils, and traces of minerals.

THE FERMENTATION

The first step in making red wines, after the grapes are brought to the winery, is to remove the berries from the stems. With native grapes in eastern America, in the home winery at least, it is far better to remove all the stems. Native grapes are so well provided with tannin and other acids, are so astringent, and must so often be picked before they are fully ripe, that the juice, ninety-nine times out of a hundred, should be fermented without the stems. In the hundredth time, with dark ripe grapes, a part of the stem might go into the fermenting vat.

Of course, every wine-maker wants to make the best and looks forward to the future when his product will be aged and most pleasing to the palate, the eyes, and the nose. This matter of removing stems is one of many delicate problems that confront him in his aim for excellence. If he ferments on the stems, there will be in a poor vintage a stalky, earthy taste and aroma; the wine will lack brilliancy in color; and will run a little short in alcoholic strength since the stems will absorb possibly .5 per cent of alcohol. On the other hand, when all is favorable for a really good wine

year, the tannin and astringency in the stems, while it may make the new wine a little harsh, will make, in the long run, a slightly better wine in all respects.

With the matter of stemming settled, crushing proceeds at once. The crushed grapes fall into the fermenting vat, which, in the home winery, is nearly always a barrel. The fermenting vat is filled about three-quarters full—perhaps a little more. One sees at once that there must be two barrel vats, if there is to be a full 50 gallons of red wine. The next step, one quickly taken, is to add a sufficient quantity of granulated sugar to bring the must up to 22 per cent sugar. (Always the wine-maker should hope that he will not have to add sugar.) If there is to be a correction for acidity, this is the time to make it. This is the time, also, to see that the temperature is at the proper degree, 75° to 80° F., either by heating or cooling (the less one has to use artificial heating or cooling the better). Now the starter is put in if one is to be used. A thin cloth, cheesecloth or muslin, is placed over the top of the barrel to keep out insects and dust.

The wine-maker has now done his duty, and can turn the must over to his hundreds of millions of helpers, the yeast cells. If all is well, one is aware that his microscopic helpers are hard at work within three or four hours by the bubbles of carbon dioxide gas which arise, break, and fill the barrel with the pungent odor that betokens fermentation. Eight or ten hours later, your assistants in this ancient art of making wine will have created a seething mass of liquid, skins, and seeds. The contents of the vat boil upward from the bottom, bringing to the surface all the solid substances—skins, seeds, and bits of stems—until a fairly solid top several inches thick is supported by the bubbling gas. This top is the *chapeau* of wine-makers. Fermentation is so exceedingly active in the chapeau, where the yeast cells are well supplied with air, that the temperature in this almost solid mass is several degrees higher than in the liquid at the bottom of the vat.

Left to itself, the chapeau will dry out and quickly become the home of *Mycoderma aceti*, most dreaded of all the bacteria which spoil wine. This organism turns wine into vinegar. Morning and

night, without fail, the wine-maker must break the chapeau up and force every part of it to the bottom of the barrel. This operation serves another purpose. The liquid at the bottom has been robbed of millions of yeast cells, and fermentation there goes badly because of the lack of air; air must be forced to the very bottom by ramming down the chapeau.

The makers of wines in the home winery use a wooden paddle or rammer to break the cap. Not so in France, Spain, or Italy. In these countries, in the old days at least, and in large vats, the chapeau was tread down twice a day by naked men who stood in the must up to their arm-pits. The custom, it appears, is no longer generally practiced, not because of uncleanliness, but because life seems to be more precious. Carbonic acid gas arises so plentifully in the vat that now and then a luckless man lost his life by suffocation.

Fermentation lasts from five days to two or three weeks. Now, another delicate problem is up for consideration. Is the fermentation finished? It is easy to tell when the yeast cells have finished their work: no bubbles arise; the chapeau sinks to the bottom; the saccharometer shows that all the sugar has been changed into alcohol; and the sweet juice is now turned into an acid and rather harsh wine.

The wine, however, is not finished when these signs say so. If a relatively light, delicate red wine is wanted, the sooner it is taken off the *marc*, as the refuse of skins, seeds, and stems is called, the better. If a robust wine is wanted, let the new wine stand on the marc a few hours, to absorb that unknown something which gives a more pronounced taste, aroma, and color.

The marc left in the fermenting vat after the wine is drawn contains a quantity of new wine which should not be lost. It can be again pressed and it will be found that the mass is a reservoir containing a considerable quantity of wine which does not differ greatly from the main body, being only a little more astringent and having a darker color. This first pressing can be stored in glass jugs, the larger the better, stoppered with loose plugs of absorbent

cotton, to be used as a reserve to replenish the loss by evaporation in the new wine stored in barrels.

A second and a third pressing is quite worth while, the marc having been stretched with sugar and water, making sure that the sugar content is up to 22 per cent. Of course, a second and a third fermentation must be carried on, the products doing very well for culinary purposes, and are very good in a punch or mulled.

These *sugar wines*, as they are called, come to maturity quickly and are drinkable by early spring if the impatient wine-maker so desires. The author's Italian helpers, to whom he always gave the sugar wines, in his winemaking in prohibition days, began drinking them the night before Christmas and by the end of New Year's Day not a swallow was left.

How much good, dry red wine may one expect from a ton of grapes? As would be expected, the amount varies greatly with the variety, the season, and the manner of making. Roughly, a generous allowance of grapes is 600 pounds for a 50 gallon barrel of wine, including that which comes from the first pressing.

SWEET RED WINES

Experienced wine drinkers, the world over, English wine drinkers excepted, denounce sweet wines, putting them only a little above unfermented grape juice, and consigning them to women and tyros taking their first taste of the fermented product of the grape. As sweet wines go in America, this characterization fits very well, but let it never be forgotten that there are sweet wines, as the best Ports, and Sherries, that are worthy of the palate of any epicure.

By all means try sweet wines made from American grapes. Let the home wine-maker try to produce a sweet wine made from his best grapes, rather than from his poorest; let the sweetness be as nearly natural as possible, though it must be said at once that with our native grapes it is always necessary to add some sugar. One always hopes for a good grape year, with certain varieties, when it will be possible to make a sweet wine out of native grapes without the addition of much sugar.

To obtain the maximum amount of sugar, the grapes should be left on the vines until the last possible day, until they are dead ripe and ready to begin to decay. If, perhaps, in dry, warm weather, they have begun to shrivel into raisins, so much the better. To make a sweet wine, one should choose, in the North at least, Iona, Diana, Dutchess, Delaware, or Catawba, as a basis for red sweet wines as well as the total constituents of a white sweet wine. Of course, for a red sweet wine there would have to be a generous quantity of black grapes to give color. Clinton, Ives, Eumelan, Clevener, or some near relative of any of these dark-skinned grapes would give color. In the South, Norton, Lenoir, and Herbemont would give color. The resulting wine could not but be good—infinitely better than the wine sold by some commercial wineries as 'Concord Port.'

A good red sweet wine could be made just as one makes a dry red wine, except that for a sweet wine the sugar content at the start would have to be considerably higher, as much as 25 per cent. The grapes should be stemmed, crushed, and fermentation should be started just as in making a dry red wine. The fermentation, however, is stopped, when the desired balance of sugar and alcohol is reached, by sulphuring or by adding potassium metabisulphite to the amount of 4 to 6 ounces per 100 gallons. Cooling and racking help in checking fermentation. A finished red sweet wine should contain 3 to 10 per cent sugar and 18 to 20 per cent alcohol. To obtain this amount of alcohol brandy must be added.

Just how long such a fermentation would run would depend upon several factors, but it would be comparatively short, not more than from 3 to 5 days. The time should be determined by the degree of sweetness desired; and this, in turn, is best determined by the saccharometer. Then the wine should be racked off, not once but several times in the year that follows and nearly as often in the second year, sulphuring each time, but less and less.

At the time of the first racking the wine should be fortified to bring it up to the desired strength of alcohol, 16 to 22 per cent, for most tastes about 15 per cent, by volume. For a truly good sweet wine, pure grape brandy, as good as can be purchased,

should be used, which, as one sees at once, makes the wine fairly costly.

After the fourth or fifth racking in the first year, the wine should be fined, a process to be discussed later, to get rid of all remaining sediment.

A red sweet wine, to be worth having, should be full-bodied, bright rich red in color, and capable of improvement for many years after bottling. Really, if good, the bottles ought not to be opened until five or ten years after they are laid down, resting quietly as it slowly improves. Fortified sweet wines keep much longer than dry wines but there is a good deal of nonsense written about the age of wines. There are few Ports, Sherries, Madeiras, or other sweet wines, authorities agree, that keep much longer than fifty years without beginning to 'go off,' though Allen, a noted English epicure, in his *The Romance of Wines*, says that some of the famous dealers in Ports 'have in their "mother stocks" wines that go back nearly 150 years.'

Allen, just quoted, says that tawny Ports are red Ports which have been 'aged in wood rather than bottles, depending on contact with the air which reached the wine in the cork.' Such a Port, he says, 'should be kept in bottles as short a time as possible.' Vintage Port, on the other hand, 'spends only two years of childhood in the wider freedom of the wood. The rest of its life is spent in cloistered and austere confinement, hermetically sealed in the bottle from all communication with the outer world.'

If, then, one chooses to make a tawny sweet wine out of native grapes, age it in wood, imitating the procedure of the commercial makers of tawny Ports. It seems that in the making of Ports, red or tawny, much blending is practiced, both of the juices used and in the finished wines. This is another hint to the makers of sweet wines who use native grapes.

It will have been gathered that this text is chiefly concerned with dry, natural wines of little alcoholic content. These are cheap, wholesome beverages, becoming more and more available to Americans, always conducive to physical well-being. They would be much more common—and drunkenness much less—were it not

for state and national taxes imposed on the wines themselves, on wine-makers, and on wine-dealers.

Yet there is a place for fortified sweet wines, as well as for unfortified sweet dessert wines. Those who like and can afford good-living would greatly miss Ports, Madeiras, Sherries, Tokays, Sauternes (many Sauternes are 'dry' as made in other places than the little district of Sauterne, France; all true Sauternes are sweet), and the many other dessert wines, many of which are drunk only at the end of a meal, though Sherry is now a popular aperitif in America, and Sauterne is a dinner wine. A maker of native wines in the home might well try to imitate them, if, perchance, he begins early enough in life to have a hope that he will see his sweet wines mature.

SPARKLING RED WINES

Several sparkling red wines are found in the wine markets of the world, of which sparkling Burgundy and sparkling Asti are best known. Sparkling Burgundy is by far the most common, although it is popular only in America. Few writers on wines seem to care for sparkling Burgundy and either condemn it or damn it with faint praise. Although the present writer likes a still Burgundy better than any other red wine, he too does not like a sparkling one.

But this writer is a horticulturist and not an oenologist. Let us turn instead to the opinions of Frank Schoonmaker and Tom Marvel, students of wines and high authorities on the wines of the world. The quotation is taken from *The Complete Wine Book*, which, by the way, is complete, and by far the best book on wines yet published in America. They say:

It would be unfair to conclude any section on Burgundy, however brief, without some mention of 'Sparkling Burgundy.' It is a fact (although a fact that we can scarcely be proud of), that Sparkling Burgundy is better known than Burgundy itself. There is a something, which a writer of advertisements might call '*a soupçon de je-ne-sais-quoi*,' about pink froth around the edge of wine glass; to order Sparkling Burgundy, rather than Champagne,

was for the proof of a 'Sophisticate' in the speak-easies of New York; and ladies who found the idea of Tyrian-purple bubbles simply too *reserché* for words, have, in the last ten years, made the fortunes of hotel-keepers in Montreal and Quebec.

Unfortunately for the travelling 'connoisseur' Sparkling Burgundy is procurable, in general, neither from the more reputable wine merchants of Burgundy, nor in the finer restaurants of Paris. Its manufacturers remark naively that it enjoys 'a vogue among foreigners.' When the Burgundian peasant marries off his daughter, he buys Champagne.

That Sparkling Burgundy is always sparkling is obvious; that, when genuine it is always Burgundy is by no means obvious; that, when genuine, it is made from wholly inferior grapes, is simply a fact. No gold capsules, pink seals, or decorated labels can alter this fact in the slightest degree. To buy it because one cannot afford Champagne is possibly a worthy economy; to pay as much for it as one pays for Champagne, is to make oneself accessory after the fact of a patent robbery. There has never been, and there never will be, a Sparkling Burgundy even faintly comparable in quality to either fair still Burgundy, or fair Champagne.

However, millions of Americans are fond of sparkling Burgundy. If you like it by all means drink it, and let writers keep their own opinions. Any maker of home wines who elects to try his hand at Champagne-making can as easily make sparkling Burgundy, since the methods are the same.

19. On Making White Wines

FOR the home wine-maker, white wines are particularly suitable. There are more varieties of grapes, especially of native varieties, from which to choose; it is easier to make white wines than red ones; they age sooner; and in the home winery white wines are usually higher in quality. Lastly, less equipment is needed to make white than red wines.

Though wine epicures generally choose red rather than white wines, excepting Champagne, which is preferred by epicures to sparkling red wines, there are occasions and moods when white wines are chosen, even by the most ardent champions of red wines. White wines are more refreshing than red wines, more cheery, better suited for gay luncheons, and are usually liked better by women. White wines are less acid than red wines, so that doctors permit gouty and rheumatic persons to drink them when red wines are prohibited.

When one drinks a fine Burgundy, a Claret, and more particularly a good Port, he must get its color, its taste, and its aroma, a process that takes an effort of the mind; the enjoyment of a white wine requires far less mental effort and is therefore more restful and enlivening. White wine is a better stimulant to the appetite, and, after a meal in which white wine has been served, the desire to work is increased, whereas a red wine brings on a contemplative mood; and, if indulged in pretty freely, a little dullness, which the drinkers of Port insist is favorable to deep thinking —Port is known as the ‘wine of philosophy.’

GRAPES FOR WHITE WINES

One might well take it for granted that white wines are made from white grapes; red ones, from red grapes. Not so. Some of our best white wines are made from red grapes, several of them being largely used in making Champagnes. No red wine can be made from a white grape. As has been said, some red grapes, which the French call *teinturiers*, have colored juice in their pulp and from these white wines cannot be made. The juice of red grapes must be removed from the skins quickly, before any alcohol has been formed to dissolve the coloring matter. None of the grapes named in the preceding chapter as good red wine varieties are *teinturiers*, and several of them make good white wines, though few, if any, should be used for this purpose by home wine-makers since there are many varieties with white skins suitable for making wine.

One may choose from the 70 grapes described in the chapter on varieties in this text an even dozen sorts very suitable for making white wines. Probably several times as many more might be chosen from the country's grape flora, but it might be difficult to obtain plants or cuttings of all these. Besides, why go far afield for varieties that are not tried and true?—though, of course, in this new field of endeavor in wine-making—using native grapes for wines—there is much pleasure in experimenting. Especially new varieties should be tried. The world does move in grape breeding, and one may predict that a hundred years hence not a single variety now grown as a standard sort for any purpose will be found in American vineyards—nearly all will drop out during the next forty or fifty years.

The ten best native grapes for white wines in eastern America cannot be named in order of value, for some grow well in one region and are not worth planting in another. The varieties, therefore, are listed alphabetically. (For a fuller description of these varieties, see Chapter 14.)

Catawba is the leading grape for white wine, chiefly because it is the base of most of the Champagnes made in eastern America. It has a little foxiness in taste and odor when the wine is new, but

this disappears after two or three years of aging. It has, in the end, a neutral bouquet and a pleasing taste which fits it admirably for Champagnes. In good seasons, its sugar content is sufficient, but its white wines are a little too acid. Catawba is the grape of grapes in the great Champagne region about Keuka Lake.

Delaware is a close second to Catawba for white wines in commercial wineries, and is a better grape for the home vineyard and the home winery. The wine is smooth and delicate, quite equalling good Moselle wine at its best. It is a little less acid than Catawba, but is usually improved by blending or by aging quite to the limit.

Diana, Dutchess, and Iona may be grouped together, as rivals of the Delaware, making quite as good white wines, all a little less acid, Iona in particular being well toward the top, if not at the top, for grapes to make white wines in eastern America. All are much sought for by Champagne makers to blend with Catawba and Delaware to bring down acidity.

Elvira is used about the Finger Lakes to make a bland, neutral, water-clear wine, very good to blend with wines a little too much on the acid side.

Grein Golden, Missouri Riesling, and Noah do especially well in Missouri, where they used to be much grown for white wines and are still the best varieties for some parts of the Southwest.

Of the grapes of recent introduction, Ontario and Seneca make good white wines, and Dunkirk and Keuka might well be tried. For that matter, Hanover, Hector, and Yates are promising, judging from the fruits alone, for none have yet been tried for wine. All these new grapes are hybrids with much desirable Vinifera blood.

The only grape in the great family of Rotundifolias fit for white wine is Scuppernong, long used in the far South, where for two or three centuries it furnished about the only wine; its wine is usually heavy and sweet, though a thin, dry, limpid wine can be made from it. The taste and aroma of Scuppernong wines are very distinctive, not liked by many, though it was once used almost wholly in a very popular sweet wine called Virginia Dare.

Anyone growing grapes for a home winery ought to try a few

of the Vinifera varieties, some of which are easily grown, as set forth in Chapter 10. They could at least be used for blending, and one might now and then get a sufficient quantity for a barrel or two of good wine. The best sorts to try east of the Rocky Mountains by all odds are: Chasselas Rose and its similar sorts, Pinot Blanc, Burger, and the several Rieslings. The finest German wines are made from these Rieslings. Can the Rieslings be grown in the East?

In the years before Prohibition, the writer was horticulturist at the New York Experiment Station and, in trying out a great number of Vinifera grapes, planted Franken Riesling. The half dozen plants of this variety were among the hardiest of these European grapes, and while the season was a little short they ripened at least two years out of three—a rather better record than Catawba made in the same vineyard. Wherever Catawba ripens, Franken Riesling, grafted on American stocks, is worth trying.

Will the commercial wineries ever try to grow European grapes? Probably not. Quick financial returns would not be in sight. Will any state experiment station try growing them on a large scale? Probably not. Public opinion does not support work with wine in American experiment stations. It is up to enthusiastic grape-growing, wine-making epicures to plant and care for them. To encourage grape-growers who attempt to grow the Rieslings, and become discouraged because they are not as easily grown as Catawbas or Delawares, let us see to what trouble Europeans go to grow them. An English author on wines, H. Warren Allen, in his admirable *The Romance of Wines*, says:

The Moselle vineyards emphasise once again the vast amount of conscientious toil necessary for the making of a good wine. The propping of the plant and the training of its branches demand hours of labour. The task of spraying the vines against insect and cryptogamic pests is endless. The surface soil of the vineyard must be perpetually renewed, and load after load of the slate which Riesling loves so well must be wearily carried on men's backs up mountain slopes. In the spring when there is danger of frosts, smoke screens are raised among the vineyards by fires of charcoal, tar and coal-dust to raise the temperature and prevent the rays of

the rising sun damaging by a sudden shock the frost-touched grapes.

In the most carefully tended vineyards some of the tall vine-props are marked with coloured rings near the top rather like the sticks that mark the conclusion and turning point of a croquet lawn. If a vine does exceptionally well in its first year of bearing, it is honoured with a white ring around its prop; similar success in its second year earns a gold band and in its third year, a blue band. Vines of average ability are marked with a red ring, while those of inferior powers are not marked at all and are destined to be grubbed up. Re-plantation is continuous in the vineyard and the old vines are replaced by cuttings from the vines which have shown their worth by a first-rate yield of grapes during three years and those props are painted with the white, gold and blue.

Would such attention to a vineyard pay? Mr. Allen, quoted above, tells of a 13-acre vineyard owned by a Herr Thanisch on the Moselle River which produced in the great vintage year of 1921 a most profitable crop. He left the 'cream of the cream' to run dry on the vines until the end of November. 'They were a veritable essence,' from which 50 dozen bottles of wine were made, each of which of these received in London sold for £6. To be sure, such a wine could not be made in America, nor could any native wine be sold for \$30 a bottle, but greater attention to the vines in our vineyards, to handling the grapes, and to making the best possible wine might bring a comparable reward.

EQUIPMENT FOR MAKING WHITE WINES

One uses much the same equipment in making white wines as is used in making red wines, as set forth in detail in Chapter 16. There is no need, of course, for a fermenting vat, since the pressed juice is fermented in a closed barrel, such as the wine will find its home for a year or two when the raw wine is being put through its finishing courses.

Cleanliness is the greatest virtue in making a white wine—one must be a monomaniac on cleanliness. Every piece of equipment used must be meticulously clean—as sterile as the instruments in a hospital. Such cleanliness is easily obtained by the free use of

boiling water and soap. The pressing bags, best if new, should be boiled.

Oak barrels and casks are more essential to red wines, dry or sweet, than to the several white wines. However, one cannot imagine Rhenish or Moselle wine-makers, whose white wines are the best in the world, using any other wood than oak for their delectable wares. Oak casks allow just enough and not too much air to pass through their staves to help the yeast cells do their work, just as unglazed pots permit plants to breathe through their pores, so that no florist would think of growing flowers in glass, cement, or tiles. For this reason, casks should not be painted or varnished outside, nor paraffined or charred inside. No doubt while wines get a little tannin from the oak, this is all to the good.

There is no question but that there is less work and that sterile vessels are more easily maintained if glass is used instead of oak. Twelve-gallon carboys are the best glass containers for a home winery, since, up to a certain point, the larger the container the better.

PREPARING FOR FERMENTATION

Stemming is not necessary, in fact it is usually undesirable in making white wines out of native grapes. Without some contact with the stems these wines seldom get enough tannin when fermentation does not take place on skins and seeds. Anyone who has picked grapes knows that as the bunches come from the vines there are insects, spiders' webs, and much foreign matter lodged between the berries. These should be picked out, passing every bunch before the eye as the trays are emptied into the crusher. Imperfections are much more perceptible in white than in red wines, and greater care must be taken to have clean, ripe grapes.

There should be as little delay as possible in crushing and pressing. The pomace of skins, pulp, and seeds is usually subjected to a second or third pressing to obtain the last drop of juice. The juice from all the pressings is usually blended in the fermenting cask, although the finest Rhenish and Moselle wines, always the best models for dry, white wines, are made by draining off without pressure, or by very slight pressure. The juice from heavy pressure

of the pomace is fermented for a second-rate wine or is used for brandy stock. White wines from drainage before pressure is milder in flavor and lighter in color.

In making white wines it is important that the juice and new wine do not come in contact with metal. Even traces of iron in a white wine may cause trouble. The wine may be clear and bright when drawn from the cask, but after aeration becomes turbid, and a precipitate forms. Such wines are usually a little off in taste. Chemists say that the cause is small quantities of iron which carry oxygen from the air to certain constituents of the wine, the union resulting in the precipitate.

Before fermentation begins the must should be tested for sugar content, and, if there is less than 20 per cent—22 is better—pure granulated sugar is added to bring the sweetness up to the desired percentage, always remembering that the addition of sugar or water, to make adjustments in the must, is an evil to be practiced only in cases of necessity.

This is the time, too, to test for acidity, and to make corrections if necessary, which is not often the case.

Now is the time, too, to put in a starter, if one is to be used. White wines more often need the addition of a pure yeast culture than red wines, since dark-colored grapes are fermented on the skins which carry their own yeast cells. Starters are made and added as stated on pages 220-21. About 3 per cent of an active yeast starter should be used. Not less than this amount can be counted upon to control the fermentation. The must, by the way, should be well aerated after the starter is put in.

A good many wine-makers add tannin just before fermentation starts; others put this chemical in the new wine at the time of fining. The addition of tannin in moderate amounts is the least objectionable of any adjustment made in the must; a half-pound, dissolved in warm water, to 100 gallons of must is not too much.

The fermentation of white wines is slower than that of red wines and must not be hurried. The temperature need not be quite so high, there is less need of warming, and fermentation does not raise the temperature so much as in red wines. In any case, the

temperature should never go above 75°. If the fermentation seems to go too slowly, which seldom happens, it may be hastened by raising the temperature; or better, by taking out a few bucketfuls and then slowly pouring back through a large funnel, thus aerating the must. Warming may be done as described for red wines.

White wines are fermented in casks, open only at the bung-hole. Always the large bubbles bring to the bung-hole a good deal of foam and muck, so that the cask should not be filled quite full. The bung-hole should be fitted with a bubble-valve. Wine, if given a chance, cleans itself, and some wine-makers in the home winery leave the bung out in the first days of active fermentation. In a sanitary cellar no dirt gets in and the ever-present vinegar flies are kept away by the escaping gas. It is surprising what a great amount of muck is thus thrown out of the cask.

The main fermentation should be over in a week or ten days, the length of time depending on the temperature and the kind and amount of starter used. In from two to three weeks from the time the saccharometer shows the wine to be dry, the new wine should be racked into clean casks, in which there are sulphur fumes, or in which an ounce of metabisulphite is put in 50 gallons of new wine. The cask should now be stored in a cool part of the cellar. Subsequent treatment is discussed in Chapter 21.

Perhaps a few words should be said about extra precautions in making white wine from black grapes. Black grapes should not be overripe, as fermentation may have dissolved some of the color; crushing and pressing should be done quickly before any alcohol can form; only the juice of the first pressing is used; and, lastly, a very little rose tint in a white wine is not objectionable, especially as it is likely to disappear in subsequent finings and rackings. Then, too, a wine-maker may choose to make a pink wine, as light or dark as he may want.

WHITE SWEET WINES

Sweet wines fall into two categories: natural sweet wines, and fortified sweet wines. The best known natural sweet wines are the Sauternes, while among the fortified sweet wines are the Tokays,

Muscatels, Angelicas, and a White Port popular in France. Some wine-makers class the Sauternes as dry wines, since they may be made without the addition of brandy, and contain relatively little sugar; but true Sauternes, as made in France, are sweet wines. A Sherry may be either dry or sweet.

Shoonmaker and Marvel, in their admirable book on wines, *The Complete Wine Book*, give this account of Sauternes:

Here are the facts: Sauternes are sweet. They are always sweet —far too sweet to drink much of, or to drink except at the end of a meal, with dessert. They are sweet because they are made according to a complicated and laborious method which assures sweetness. They are, along with the fabulously expensive great Tokays, and the *Trockenbeerenauslesen* of the Rhine, incomparably the best natural sweet wines in the world, rich, full, and possessed of a bouquet as superb as it is inimitable.

Sauternes are, in general, the most expensive non-sparkling wines made in France—not so much because the supply is limited as because the vineyards of Sauternes have, per acre, the lowest yield of wine of any intensely cultivated and fertile vineyards in France. For, in order to produce a sweet wine in the by no means torrid climate of the Bordelais, it is necessary to leave the grapes on the vine until they are not ripe, but over-ripe, sugary and shrunken, until that so-called ‘noble rot’ (*la pourriture noble*) has set in. It is necessary that the pickers, during the grape harvest, go through the vineyards over and over again, selecting the bunches that are ready each day, and leaving those that have not acquired the proper degree of over-ripeness. That such a process involves considerable expense, and that shrunken grapes yield less wine than ripe grapes, is of course obvious.

Our American Sauternes are far different wines than the great wines of this name from France. More often than not they are made by adding to a dry white wine a grape concentrate to give it sweetness, and brandy to bring up its alcohol to the desired strength. Or, a white wine is stopped in its fermentation by sulphuring or by the use of metabisulphite; or, again, sugar (plain granulated) and brandy are added to a white wine. None of the wines masquerading under the name Sauterne from America,

South America, Africa, or Australia bear much resemblance to the true wines of this name from France.

The best American wines of this type, some of which are very good, are made in California from Semillon, Sauvignon Vert, and Sauvignon Blanc. These grapes are left to ripen, as in France, but not to so great a degree of overripeness, until the sugar content is 25 per cent. The must is allowed to ferment until the desired degrees of sweetness and alcohol are reached, when fermentation is stopped by sulphuring or the addition of metabisulphite. Such Sauternes contain from 3 to 5 per cent of sugar and 12 per cent of alcohol. Some Sauternes contain considerable sulphur dioxide which medical men tell us does not add to the wholesomeness of the wine.

It would be difficult to make a really good sweet wine of the Sauterne type out of native grapes. On the other hand, very good sweet Catawba, Delaware, Iona, Diana and other white sweet wines can be made, if not as natural wines, certainly as fortified wines in which some sugar and some brandy are added. Properly made, they are pleasant after-dinner wines, and serve very well for teas and other gatherings where a sweet wine is wanted. By all means, let us call them by the names of the grapes from which they are made, not Sauternes.

20. On Making Sparkling Wines

IT seems a little ambitious to include a chapter on sparkling wines in a book written for those who make wine in the home; for few will believe that sparkling wines can be made in a home winery. Yet it can be done without a very great deal more trouble than making a still wine, if a little more equipment and a little more time be taken. Besides, every home wine-maker ought to be interested in the process of making sparkling wines.

When sparkling wines are mentioned, everyone thinks of Champagne, though there are several other commercial sparkling wines, and any dry wine, white or red, may be made to sparkle. Since everyone who drinks wine knows Champagne, suppose the making of that wine be discussed, all other sparkling wines being made in much the same way. Champagne is an effervescent wine made in or near the old province of Champagne in northern France. The name is now applied to sparkling white wines made in any part of the world. Thus we have California Champagne, New York Champagne, South African Champagne, and so on.

The effervescence in Champagne is produced by incomplete fermentation; or, more precisely, by arrested fermentation produced by adding sugar to a white wine after it has been bottled; thus a new fermentation starts, but does not go all the way through in the air-tight bottle. A sort of bogus Champagne, not to be compared with the true Champagne in quality, is produced by adding carbonic acid gas to a bottled white wine, just as the sparkle is squirted into soda water or ginger ale with which carbonated wine should be classed, rather than with the noble drink discovered, as we are so often told, by the old monk, Dom Pérignon, nearly three centuries ago.

CHAMPAGNE GRAPES

In France, the grape most commonly used is Pinot, a black grape, the same one out of which the great Burgundies are made. Pinot Blanc, a white grape, is also largely planted in the French Champagne region and much of this sparkling wine is made from a blend of the two varieties. Several other grapes are grown for blending, each large maker of Champagne choosing the grapes that suit his taste best.

So it goes in the Finger Lakes region in America, where much of the American Champagne is made. Catawba is the base of nearly all the Finger Lakes sparkling wines, with Delaware coming next. Catawba has a little foxiness the first two years in wood and bottle, but loses it with age. Delaware is neutral but is a little acid, as is Catawba, to offset which Iona, Diana, Elvira, and Dutchess wines are blended, since none of these is so acid. Isabella, Ives, and Eumelan, all black grapes, are sometimes used in making Champagne, and these three with Clinton are used in making a sparkling red wine.

The makers of California Champagnes presumably use the two Pinots, so beloved by the French. No doubt they blend other wines with them, but that does not appear in print, most Champagne makers preferring to keep their methods secret. Wherever sparkling wines are made a rose-tinted one is not infrequently offered, a white wine in which is a little red.

The question is always being argued whether American Champagnes are as good as those made in France. Certainly they are different. The Champagnes made in eastern America are not quite so light and delicate, have a slightly different taste, and have a little more color. The Champagnes of the Finger Lakes sparkle a little longer than those from France. In a test of several sparkling white wines from the Keuka Lake region, the average length of effervescence was 45 minutes; for five of the best French Champagnes, 43 minutes. The percentage of alcohol by volume in the foreign and domestic Champagnes was about the same: in none less than 12 per cent, nor more than 13.50 per cent.

Those Americans who drink Champagnes and have done so over a long stretch of time, like the good brands made in this country quite as well as those that come from France. Europeans who have always drunk French Champagnes do not like the American brands so well; but this is true of almost any foods or drinks common to the two continents. Certainly American methods of making sparkling wines are as good as those of Europe, and the equipment for the several processes in making them averages much better.

American Champagnes are of greater excellence than the various types of Sauternes, Ports, Claretts, Burgundies, and Tokays made in this country. This is supposing that the best types of these wines are made in the two continents are compared. When it comes to ordinary wines, American-made wines are quite as good as those made in Europe—home-made wines are better.

THE ORIGIN OF CHAMPAGNE

No one writes at any length about Champagne without repeating the pleasant tradition about its origin. This great wine was first made at the Abbey of Hautvillers at Epernay, not far from Rheims, long the metropolis of the Champagne world. The discoverer was, according to the French, a monk, Dom Pérignon, cellarer of the Abbey of Hautvillers. It is to be feared that there is not much truth in this oft-repeated account, but the people in the wine region round about Reims must believe it, for a few years ago they celebrated the 250th anniversary of Champaigne, at which a crown of wine leaves was placed on a statue of Dom Pérignon.

One likes to believe that it was Dom Pérignon who put the sparkle in wine, for he seems to have been the most notable wine-maker of his region and age. To begin with, he was the cellarer at the Abbey of Hautvillers for forty-five years and that in itself is something. There had been wine-makers in this region for centuries before this, but up until 1695, the date given for Dom Pérignon's discovery, all the wines had been still.

According to tradition, verified somewhat by the *Memoirs of*

Abbé Godinot, published in 1718, the patient observation and research of Dom Pérignon established a definite method of making sparkling wines, which before his day occurred only by accident, such as every maker of wines occasionally has, usually brought to his attention by the popping of bottles in a fermentation following bottling.

Not only did Dom Pérignon discover that he could put pearly bubbles in a still wine by using a controlled fermentation, and could keep them in a thick strong bottle and a cork kept in by wiring, but he it was who first found means to remove the sediment. He is credited, also, with having perfected blending, whereby wines were made having a delicacy and limpidity unknown before his day. He, also, is credited with being the first to employ corks, bottles having been stopped up to his time with hemp dipped in oil.

ON MAKING CHAMPAGNE

To make Champagne requires the highest art of the wine-maker. In general, the same methods are used in every part of the world in which sparkling wines are produced, though in Italy several sparkling wines, of which sparkling Asti is best known, are made by processes differing considerably from those used in making Champagne. The process used in the Finger Lakes region of New York, where, perhaps, more than half of America's Champagne is made, is much the same as that of France.

The sparkling-wine industries of this region, and of other parts of America where these wines are made, have usually been founded by Frenchmen from the province of Champagne, and men from Rheims are still occasionally brought over to impart new knowledge to American competitors. The Americans have utilized not only the technic of the French, but have copied as well the type of cellar and vault construction, and the equipment of the Old World cellars. In regard to equipment, Frenchmen coming to work in American establishments say that on this side of the Atlantic it is far better than in their home land.

THE CUVÉE

In America, as in France, or in any wine country where sparkling wines are made, the basic wine is a blend known as the *cuvée*. The *cuvée* in the Finger Lakes region is, as has been said, most often Catawba wine, with that of Delaware coming next, blended with Iona, Diana, Elvira, and Dutchess, all wines much desired when the grapes can be had. The blends of these several wines give a smooth, delicate mixture quite comparable in taste and bouquet to the good white wines of Europe.

The fermentation for Champagne is started and controlled by the use of whatever pure yeast the wine-maker may fancy, and throughout this first fermentation the temperature is kept comparatively low. In spite of the low temperature, as in the beginning of every active growth of yeast cells, a tremendous agitation goes on. The must bubbles, boils, and hisses until the yeast cells exhaust themselves. By the time cool weather comes on the wine becomes quiet, calm, and clear, and is ready for its first racking, to be followed by several others, during which time the wine is kept cool and at rest during the winter. The casks are relatively small while the wine is in them, in order to obtain the maximum amount of aging by oxidation without undue danger of spoiling from a vinegar fermentation.

In its several years in cask and bottles before a sparkling wine is ready to be put on the market, it must be kept in a perfectly controlled temperature, otherwise this 'good familiar creature' may fret and fall ill. It not only reacts badly to changes in heat and cold but to moving, and would probably be upset by the vibrations of trains, street cars, or even much rumbling of automobiles and trucks. A deep vault impervious to changes in temperatures and to vibrations is imperative.

Just prior to bottling, the blend, *cuvée*, or the marriage of good true wines, is made according to a particular formula of the wine-maker. Here is where each establishment making sparkling wines demonstrates its particular skill—just what wines, and their proportions, depend upon the sixth sense that men have who spend

their lives making these fine wines, with the most delicate tests, can vintage, each one different from vintner.

Some chemistry is needed, however none however requiring very complex maker must know pretty accurate still wine before it is bottled; he alcohol and acids. More than 3% much residual sugar, which might If a *cuvée* contains much more than there is difficulty in obtaining the all. As to acidity, a content of .7 per cent may make the wine too tart; if much less, the may again become cloudy. Very neutral grapes, as all eastern wines are, a neutral California wine may be used the use of California wines in a and bouquet.

THE SECOND FERMENTATION

In due time, usually short, the bottles dark green Champagne bottles are corked out of the best Spanish corking with steel straps called *agraffes*. ('The finished bottle of wine are said to must at the time fermentation begins, be stored in tiers in the vaults of the wine perfectly controlled. In the early America, one might hear, on a hot day, noise of pistol shots. Better control prevented loss from breakage.

Soon after the bottled wine is sealed, second fermentation starts, the yeast into alcohol and carbonic acid gas. If the temperature, there may be breakage.

and the finished Champagne will be 'wild.' On the other hand, too little sugar means insufficient effervescence. A pressure of about 100 pounds per square inch is wanted.

The temperature at the beginning of the second fermentation is kept at 65° F., or slightly less, until a deposit of dead yeast cells in the bottle shows that a vigorous fermentation has started. The temperature is then lowered to 50°, at which it is held until fermentation has wholly ceased; after which it is again lowered to 40° for a month to precipitate any excess of cream of tartar.

The wine now lies tranquilly at rest in the cool dark vault, dreaming through the cold of winter and the heat of summer, awaking, so the wine-makers believe, for brief periods when the vines from which the grapes came blossom and again in autumn when the fragrant, maturing fruits of the vineyard betoken a new vintage. This time of peace is now rudely broken by a rough-and-tumble conflict with its human masters to get rid of the sediment which has formed on the undersides inside of the bottles. This fight lasts at least three months and may continue for six.

THE REMUAGE

The conflict between man and wine just mentioned consists of a good vigorous pounding of the bottles to break loose the sediment from the inside surface of the bottle, after which the bottle is shaken day by day, over and over again, until all the sediment lies on the cork. This process is called by the French the *remuage*, a high-sounding name which prosaic Americans term 'clearing the wine.'

The *remuage* is begun by putting the bottles in a pounding machine where they are mauled and hammered until the sediment is broken loose to the last speck and held suspended in the wine. Now begins the tedious process of shaking, wherein lies the highest single expense in the making of Champagne.

The bottles are put in special racks, or clearing tables, or pulpits, as you prefer, at an angle of 45° with the neck down. To work the sediment down on the cork, trained workmen daily for three or more months lift each bottle in the rack, give it a quarter turn

jolting twist, neck down in the rack. Little by little the sediment slides down and settles on the cork. This operation is finished only when the sediment is all lying on the cork and the wine is crystal clear or candle bright as wine men say.

It has already been said that the *remuage* requires from three to six months. Why the difference in time? The variation in time depends on the character of the sediment. The sediment consists almost wholly, at this stage of Champagne making, of dead yeast cells. The length of time required to clear the wine is largely dependent on the strain of yeast used, of which wine-makers may choose from a hundred or more. Each brand of Champagne is made by a particular yeast. A yeast is used, if obtainable, which has large heavy cells producing a heavy sediment, which settles quickly, rather than a yeast which produces a light, flocculent sediment. Some yeasts, usually wild ones, may ruin an entire bottling by making clearing impossible.

DISGORGING

Next the Champagne maker gets rid of the sediment, an operation known in American Champagne cellars as *disgorging*. For considerably more than two centuries men laboriously got rid of this sediment in a tedious, wasteful way.

The wine was wheeled or carried from the vaults to an upper workroom; the fastening of the cork was removed, the bottles being held with a sharp downward angle, and the cork shot out with a true Champagne pop. A deft workman slipped his thumb over the top of the bottle to keep too much wine from escaping. In spite of the skill of the workmen, there was some waste of the precious wine, and so much danger to the man doing the work that hands and face were protected, the hands with heavy gloves, the face with a wire mask.

Disgorging is done differently now, by a method introduced in one of the Keuka Lake establishments. The cleared bottles are placed upside down in a brine-freezing mixture so that about an inch of the wine next to the cork is frozen, forming a cork of ice inside the outer cork, which holds the sediment in place when the

bottle is right side up. The *agraffe* is now loosened, the pressure in the bottle blows out ice, sediment, and cork, together with a small quantity of foamy Champagne. The wine is now as dry as can be, all the sugar put in at the time of bottling having been turned into alcohol and carbonic acid gas.

The Champagne is now *dosed*, in a dosing machine, where a measured quantity of syrup is added, together with enough Champagne from a fellow bottle to make up any wastage. The dosing machine is so made that during this brief interval the bottle is kept under pressure to avoid loss of gas.

There are usually three degrees of sweetness in Champagnes. The Champagne sold as *brut* contains up to 1 per cent by volume of the sweetening liqueur; extra dry, up to 3 per cent; dry, or *sec*, up to 5 per cent; sweet or *doux*, up to 8 per cent. Makers of Champagne vary these quantities of the sweetening liqueur considerably in accordance with the wines and blends used. The sweeter the Champagnes, the more effervescent.

In buying Champagnes, one should know that the dryer it is the higher the quality. As in humans, Pollyanna sweetness may cover up faults. The *bruts* are the most nearly perfect; the *doux*, the least. The tastes of peoples vary in their choice of the different degrees in sweetness of Champagnes. Americans, Frenchmen, and Englishmen like the driest Champagnes—at least the wine epicures of these three peoples do; Russians like the sweetest; Germans do not discriminate in their choice.

After dosing, the bottles are stoppered with corks as nearly perfect as human ingenuity can make them. The corks are wired down strongly and the Champagne is left to itself for the rest of its life. When offered for sale it is dressed in gilt, or red, or both, and labeled with the best the lithographer's art can supply. Champagne is in its prime from the time it is put on the market until it is 15, or at most, 20 years of age.

CHAMPAGNE MAKING IN THE HOME WINERY

This chapter, scant and fragmentary as it is to the Champagne vintner, will seem too complicated and difficult for the home

wine-maker—but not if he has ingenuity. Exact precision in blends, temperatures, and sweetenings are not so necessary for a home product. A home-made rack is easily devised, and the pounding and turning may be scanted and yet the sediment may be made to settle on the cork. It is not difficult to find means of holding the necks of the bottles in a brine mixture that will freeze an inch of sediment below the cork. Champagne bottles, corks, and the wiring to hold the corks in place can be purchased from wine supply houses. Happy chance may give a splendid lot of Champagne to the home wine-maker, and, at its worst, what one gets will be better than the sparkling wines made by the soda-water process of carbonating, which you are bound to have offered you from time to time.

In such Champagnes as the author tried to make in his little winery of Prohibition days, there were several difficulties scarcely to be overcome. Chief of these was, and will be with all who try to make Champagne in the home, that the wine continues for such a desperately long time to rid itself of impurities, which sink down on the sides of the bottles as sediment. Few care to wait three or four years for all the sediment to fall; few can or will loosen this sediment from the sides so that it drops on the cork to be disgorged. This means that home-made Champagne, if kept long, will have some sediment.

To be sure, there is an easy way of making Champagne for home use only. A very good sparkling wine can be made by keeping the bottles upright so that all the sediment falls on the bottom. The tiresome operation of loosening the sediment and disgorging are thus avoided. With some cultures, it is amazing how tightly the sediment sticks to the bottoms of the bottles and how little it clouds the sparkling wine as it is poured into glasses at table. If the wine is handled with very great care, it may be poured down to the very last inch without a trace of cloudiness, so that the proud maker, if he covers the bottle carefully with a napkin as he pours, may delude any but an expert into believing he is the maker of real Champagne. Of course it is better to go through the whole process of loosening sediment and disgorging as best one can.

Another difficulty is to be sure that too much sugar is not put in the dosage for the final fermentation. If the dosage is too sweet there will be some breakage of bottles and some premature popping of corks—and, of course, too much sediment. It is better to err on the side of not quite enough sugar for this final fermentation than too much, even though the effervescence falls a little short in quantity and in the length of time the pearly bubbles continue to rise. In making Champagne in the home winery, in the final dosage it helps amazingly to add a little fine French Cognac, which not only raises the alcoholic content, usually a little low in home-made wines, but also greatly enhances the bouquet.

Few makers of wine in a home winery will be able to make year after year really good Champagne. Some years one's vintage may approach that of the best; some years, luck will be all against him. Still, Champagne is expensive, and one of moderate means—as is the case of most who make wines at home—may have this noble drink as often as he likes. Then, too, some of us may live to see another period of Prohibition.



21. The Care of New Wine

THE tempestuous first fermentation, which in a few days turns most of the sugar of the must into alcohol, does not finish the work of the yeast cells. There is a much longer second fermentation before the beneficent yeasts are through with their work. Not until this later fermentation comes to an end, and the last trace of sugar, in the case of dry wines, has been converted into alcohol, so that the yeasts starve and die for the lack of nourishment, can the wine-maker dispense with the help of micro-organisms. Meanwhile, much painstaking care must be given to provide the new wine with proper environment.

CONTAINERS FOR NEW WINES

As has been stated several times before, by far the best containers are clean white oak casks; after which the choice falls on 12-gallon carboys for those who are making wine in small quantities. Whatever the container, each one should be equipped with a water-valve in the bung; or, the bung-hole may be closed with an inverted bung. The purpose of the water-valve, or the inverted bung, is to permit the escape of carbonic acid gas and of such parts of the lees as come to the surface. Of course, the water-valve is more efficient in keeping out air, but if the container is kept filled to the brim not much air can enter. When the second fermentation is far enough along so that few bubbles arise and the lees cease to come to the brim, the bung should be driven in so lightly that air may still escape.

Again it must be emphasized that the containers should be as clean as boiling water can make them. In this work of cleansing,

a handful of washing soda put in each cask or carboy helps a great deal. All trace of this alkali must be removed by several rinsings with hot water. After washing, the cask is left to dry with bunghole open, and is then sulphured in accordance with directions given on page 206.

If through carelessness or bad luck, a container of wine begins to turn into vinegar, it should be removed as soon as discovered and the cask emptied and kept out of the cellar until it has been cleansed from the least taint of vinegar, if, indeed, that be possible. One lot of vinegary wine in a cellar may and almost certainly will turn all the new wine in the cellar into vinegar.

FERMENTATION BUNGS

In Circular 88, California Agricultural Extension Service, a fermentation bung is described which anyone can make at home. It is depicted in Figure 37.

RACKING

The second fermentation runs on for six weeks or two months, coming to an end sometime in November. Meanwhile, there is a loss of wine in wooden vessels from evaporation through the staves and the bubble-valve. This loss should be made up by replenishing with wine put aside for this purpose at the time of pressing, keeping the casks full to the bunghole at all times.

At the close of the second fermentation there is at the bottoms of the casks, underneath the clear, bright wine, dead yeast cells, cream of tartar, spores of bacteria, and fragments of skin, seeds, and stems. The wine has been clearing itself. This viscous, murky mass is the *lees*. If the new wine is left on the lees, in the spring when the temperature rises, the yeasts lying in suspended animation and the spores of bacteria awaken and multiply, with the

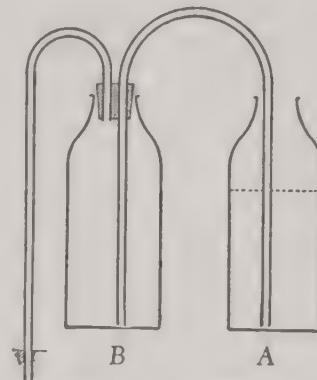


Fig. 37. A, a bottle two-thirds full of water, connected to a larger empty bottle, B, by means of tubing. B is stoppered with a two-hole stopper and contains the tube to the bung on the storage vat. B acts as a trap for the water in A in case a suction develops in the storage vat.

result that the wine loses its clean taste and clear color, or, perhaps, is spoiled. The wine must be racked into another clean, sterile cask.

Racking is one of the simplest operations in wine-making. A clean hose, well sterilized by boiling, attached to a sterile wooden rod, is put in the wine to be racked, rod and hose being so adjusted that the hose is just free from the sediment so that the lees are not disturbed. Let the wine fall into the clean container from the top of the bunghole so that it will be thoroughly aired, thus giving the remaining yeast cells their fill of oxygen, helping them to new life.

In northern climates the wine is racked a second time at the end of winter, say the first of March, before the coming of warm weather; a third time in June, after spring activity; a fourth time in October; once more the next spring, and again in the autumn, after which it should be bottled. It is to be feared that most wine-makers in homes skip some of these rackings.

The racking should be done on a clear day when the barometer is high. The reason for choosing a day when the barometer is high is that there is much carbonic acid gas in new wine, which rises more freely when the barometer is high, bringing with it the lighter elements in the lees, leaving the wine clearer.

Between the several rackings there will have been more or less evaporation through the staves of the casks and the volume is still further decreased by the loss of the sediment left behind. Wine in glass does not 'breathe'—to its disadvantage—and there is little evaporation, so fewer rackings may be necessary. From start to finish, the containers, oak or glass, must be kept filled. For the first few weeks, they should be filled twice a week; then once a week; once in two weeks; and finally once a month. These fillings should be of wine reserved for the purpose from wine of the same age and kind.

It used to be thought that the purpose of these fillings was to keep the air out. Pasteur, however, tells us that a little air is good for the new wine, and that the real purpose of the *ouillage*, as the French call this filling up of the casks, is to protect the

wine from injurious yeast cells, especially the vinegar yeasts which require much oxygen for their growth.

In all rackings subsequent to the first, the wine should be less and less exposed to the air. This is a very necessary precaution with white wines, which may become discolored by oxidation. A good rule is, in the later rackings, to keep the mouth of the siphon below the surface of the cask which is being filled. Some lees come over in the first racking, but less and less, as one might expect, in the later ones.

After each racking and replenishment, the bung is lightly hammered home. In order to keep the bung tight, the container should be rolled a little to one side so that the bung is wet and swollen. If possible, after the first racking the temperature should be kept in the forties or lower fifties; not colder nor warmer than these outside limits.

CLARIFICATION

Even when all possible care has been taken in making wines, whatever the kind, some waste substances are held in suspension, which prevent the wine from taking on the bright, clear color so much desired. Most wines, therefore, must be *clarified*, or, to use a term more common among wine-makers, *fined*. Clarification has been compared to 'spreading a net with extremely fine meshes upon a wine, a net which will slowly sink to the bottom of the cask, carrying with it the solid particles of various substances in the wine.'

Exposure to cold, refrigeration, heating, and filtration are used in large wineries to clarify wines in volume, of which only exposure to cold is readily feasible for the makers of small quantities of wine. Long continued exposure to a temperature of from 30° to 40° F. will do the work of clarification very well, but the use of fining agents is easier and much more effective.

The commonest and about the best of these agents are white of egg, gelatin, and isinglass. These substances combine with the tannin in the wine to form an albuminous network which slowly sinks to the bottom, carrying down all the solid matter which the wine held in suspension.

Red wines are usually high enough in tannin so that none need be added. Most red wines, with their high tannin content, clear themselves, but if before bottling they are not brilliantly bright, it is well to clarify them, only the albuminous substance being added, for they are well enough supplied with tannin. Clarification, by the way, if properly done, does not change the taste or aroma of any wine, red or white, but may carry down a little of the color of red wines, especially if the tannin is a little low.

Nearly all white wines are greatly improved by clarification. White wines in glass are in greater need of some fining agent than those in oak, since a little tannin is absorbed from the wood of the cask. Most makers of small quantities of wine use the whites of eggs, in which case the white of one egg should clarify ten gallons of wine. If gelatin is used, six grams of leaf, powdered, or granular kitchen gelatin suffices for ten gallons of wine. With either white of egg or gelatin, five grams of dry tannin should first be added for each ten gallons of wine. Isinglass, once much used, is not so easily obtained nor so satisfactory as the other two fining agents.

It is best to buy the precise amount of tannin from the druggist; dissolve it in water gently warmed; then add it to a quart or two of the wine to be clarified, stirring vigorously with a wooden stick. If white of egg is used, whip well after adding a pinch of salt. In case the choice of fining agent is gelatin, soak in warm water until it is dissolved; then add to a quart or two of wine and stir with a sterile stick.

Whether egg or gelatin, whether red or white wine, let the cask remain quiet for ten or twelve days and then rack from the sediment. As with all racking, the work is best done on a clear day when the barometer is high. Probably the best time to clarify is after one of the spring rackings.

INTERLUDE

The battle that the yeast cells have so long and so well carried on to make wine out of grape juice is now over. Most of the sugar has been transmuted into alcohol; a vast amount of carbonic acid

gas has bubbled into the air; a little glycerine, a dozen or more esters, minute quantities of various other substances remain behind; and a clear, bright wine has been separated from gallons of murky lees. Good yeast cells and bad, all starved to death for lack of nourishment, have been removed with the lees. The wine is made.

What a disappointment! Pleasing to the eye and possibly pleasant to the nose, though smelling too much of grapes, to the taste it is hard, acid, rough, and astringent. Will it ever be drinkable? If, at the last racking before bottling, a wine is mild and soft enough to drink, one should be suspicious of its keeping quality. Give a pleasant-tasting young wine five years, after which it steadily deteriorates. On the other hand, a harsh, acid young wine, after a period of quiescent slumbering in the bottle, loses its raw, acid taste and grapey aroma and becomes soft, mellow, aromatic, and full of wine virtues. Such a wine has strength, character, and what vintners call *body*. For five, ten, or twenty years a dry red wine becomes better and better, while full-bodied sweet wines may improve twice or three times as long. White wines have shorter lives.

The bouquet of an aged wine is much more delicate and pleasing than the simple fruity odor of a new wine. A wine too foxy to drink because of its rank taste and odor may become drinkable after the lapse of a few years in cask and bottle, though it would be expecting too much to look forward to much improvement in a wine made from Concord or Niagara. As wines age they change a little in color. A red wine takes on a brownish color; a white wine becomes yellowish brown or golden.

Since wines were first made, simple folk have believed that there is spiritual relationship between wine and vine, which finds expression—a rhythm in nature, so to speak—in spring when the sap is ascending and flowering time is at hand, and, again, in autumn when grapes ripen. At these two great life events in the growth of a vine, no matter what the age of the wine, nor how far away from home—Halifax or Borneo—the wine imprisoned in its bottle

quicken in joy. The only practical use of this supposed behavior of wines is that at these times, if the wine is in wood, it should be racked at the end of the period.

BOTTLING

The length of time wine should stay in the cask varies widely. One can say definitely that all wines should remain in the cask until they are at least a year old. On the other hand, a tawny Port or a Sherry may well be left in the wood until it is ready for immediate use—practically its whole life. A wine bottled before the second fermentation is finished loses its brilliancy, may become cloudy, and almost certainly will pop the cork. In tyro days in wine-making, many a man lost bottles put away too soon and had to listen to them popping their corks, sounding like a miniature battle in the cellar. Few amateurs escape some such calamity.

Fine wines, rough and acid at first, are better off in the wood two, three, or four years. White wines are bottled after a shorter stay in the cask than red ones. A little depends on the alcoholic content. The more alcohol, the longer a wine may stay in the wood. No wine with less than 8 per cent of alcohol is worth putting in bottles; if it is bottled, it should be used at once.

Wine should always be put in wine bottles. It is as much out of taste to serve wine from a beer- or ginger-ale bottle as it is to serve a dinner on tin plates or on a table with an oilcloth covering; though, to be sure, one is sometimes forced to make a virtue of necessity. Bottles, corks, corking-machines, and corkscrews are discussed in Chapter 16.

Clean, sterile bottles are imperative. They should be washed thoroughly in a solution of hot water and washing-soda, scrubbed inside with a bottle-brush, and rinsed with hot water. If the bottle-brush does not loosen the sediment in the bottom and sides of a bottle, a handful of fine shot or coarse sand in a little water, shaken about, will remove the tightest sediment. The wine is put in the bottles by siphoning through a rubber hose, taking care not to disturb the sediment at the bottom of the cask.

The filled bottles are laid on their sides in the wine-bin, so that

the corks are kept moist. The storage room for wines should be dry, dark, and of an even temperature, not much above 50° F., winter or summer, if such a room can be had in a modern dwelling. If the cellar is damp, the corks may mould and should be protected by dipping in melted sealing wax, better not done in a dry cellar as it prevents 'breathing.'

The French say that newly bottled wines have 'bottle fever,' owing to the exposure to air in the transfer from cask to bottle. There is no doubt that the balance of the wine is upset at this critical time, for which reason bottles should not be opened for a few months.

SICK WINES

Wine is the happy hunting ground of a great number of micro-organisms, besides the all-important and helpful family of *Saccharomyces*. None except those of the one friendly family are beneficent, and some cause serious sickness in any wine in which they are given a chance to grow. If, perchance, a deleterious organism gains a strong foothold in a cask of wine, there is not much that one making wine in a home winery can do.

There is no use doctoring poor or unsound wines. One cannot take away the odor of a vinegary wine; and the taste of a doctored wine is more often than not a nauseous draught. Here, indeed, an ounce of prevention is worth a pound of cure; for, usually wine diseases are easily prevented by proper sanitation of the wine cellar.

Sanitary measures consist of keeping the wine cellar scrupulously clean and in the free use of sulphurous acid. Sulphur, a very present help to the wine-maker in many times of trouble, may be used by freely burning sulphur matches in cellar and casks; or, by the free use of metabisulphite, a chemical easily obtained at any good drugstore. In using the sulphur match or the chemical in casks, too much may be worse than the disease, since overdoses leave sulphites in the wine, which in quantity have a nauseous taste and smell. A half ounce of the metabisulphite is quite enough for a fifty-gallon barrel of wine; burning three or four inches of a sulphur match in a barrel suffices.

In most large wineries, the sulphur treatment is supplemented or supplanted by pasteurization or by filtering. The must or the wine, or both, are pasteurized by heating to a temperature of 180° F. for one minute. Either pasteurization or filtering requires rather expensive apparatus unnecessary and often impossible to use in a home winery.

Of the dozen or more diseases of wine, only two are common in household wine-making—at least only two that the householder need take precaution against. One of these is caused by *Mycoderma aceti*, which turns alcohol into vinegar. The least trace of vinegar in wine is perceptible to the palate, to the nose, and to the eye. Taste and smell readily tell of acetic fermentation whereby vinegar is formed, but, first of all, a white chalky film may be noticed. This film consists of small rod-like vinegar organisms. Ninety-nine times out of a hundred the best thing to do is to dump the infested wine down the drain and fumigate the cellar to save the remaining casks. In the hundredth time, if it is thought the acetic fermentation is just beginning, the wine may be saved by adding an ounce of metabisulphite to fifty gallons of wine. It is to be remembered at all times that vinegar yeast thrives only in the presence of oxygen. The ounce of prevention is to keep the container filled to the brim at all times.

The other disease that very often makes the home wine-maker heavyhearted is an appearance on the surface of the wine—not in taste or odor—very like a vinegar fermentation. It is caused by a yeast, *Mycoderma visi*, closely related to the vinegar yeast. The film is even more chalky and is thicker than that of the vinegar fermentation. To the bacteriologist this disease is *Mycoderma*; to the wine-maker, *flowers of wine*. These yeasts are not difficult to get rid of if steps are taken in time; they cannot survive long without air, and if the cask is kept filled to running over they will not be troublesome, though they may ruin a wine. They are easiest destroyed by putting a funnel a few inches below the surface of the wine and pouring in more wine so that the flowers of wine are floated off. Of course, the cask about the bung must then be made sterile.

UN SOUND WINES

There are two or three non-bacterial defects of wine which may trouble the wine-maker in small wineries. In a bad year when the weather has been ungenerous to grapes, so that the crop does not ripen; when insects and diseases take so great toll that the sugar content is low and the must is over-acid, it is difficult to make a sound wine.

More likely than not, even the man who professes to be an epicure and says he will have only the best will try to make up for the shortcomings of nature by adding generous quantities of sugar to increase the alcohol and will lower the acidity by pouring in water. Both are regrettable expedients, to be resorted to only under dire necessity. Unless the epicure among home wine-makers is very short of wine he had better skip an occasional bad year, laying in a full supply when grapes are as near perfect as possible.

Wines made from grapes containing mouldy or rotten berries in any considerable quantity are usually unsound. The wines are cloudy; red wines turn brown and white ones yellow. Prevention of this cause of unsound wines is obvious. Sulphuring the must or the use of metabisulphite helps to destroy the enzyme which causes this unsoundness.

Another common cause of unsound wines is the presence of iron, copper, or aluminum in the must. Neither must nor wine should ever touch iron. All iron utensils used in wine-making should be tin-plated, enameled, or lacquered. They should not be galvanized, because zinc is attacked by the acid; must and wine are then not only discolored but are made unwholesome. Bright, clean copper is not attacked by the acids of wine, but tarnished copper is, and is poisonous. To be on the safe side, use wood and glass as much as possible, or new enameled, tin-plated or heavily lacquered iron. Aluminum, in contact with wine, imparts an undesirable taste.

22. On Serving Wines

THERE are many opinions about serving wines. Epicures lay down rather stringent rules on what wines to serve on various occasions and with this and that food. Diogenes, when asked what wine he liked best, quickly replied: 'That which belonged to another.' Don Quixote, when asked a similar question about when to drink wine, said: 'I drink when I have occasion and sometimes when I have no occasion.'

Most connoisseurs have individual sets of rules which they expound and follow in their wine-drinking, with the result that there is no end of confusion in all matters pertaining to serving wines. There is altogether too much mumbo-jumbo about wine-drinking. Still, there are 'conventions.' With the strict injunction to the reader that the best of all rules is: 'Drink what you like, and when you like, and hang the rules,' we come to the two chief questions having to do with serving wines; the questions are: 'What shall I serve?' 'When shall I serve it?'

WHAT TO SERVE

Dry wines are table wines; sweet wines are dessert or after-dinner wines. Most of the wines made in a home winery are table wines for day-to-day consumption. To be sure, everyone who makes wines should try his hand at both red and white sweet wines, which should do very well for ordinary occasions, and which, in an occasional year, may be so good that they are quite fit for anyone at any time. After all, however, it is impossible for any American to make at home a Sherry or a really good Port. There

needs, then, to be in every home cellar a few good bottles of Sherry, Port, Sauterne, and some specially fine dry wines from European vineyards. All who can afford a case of Champagne should stock his cellar with this indispensable concomitant of a wedding feast, a dinner for a distinguished guest, or any one of a dozen gala occasions that come to every household.

There should be in every cellar of one who uses wines freely several kinds of Sherry. At present, Sherry seems to be the wine that is best suited for various occasions. It is largely used in English-speaking countries as an appetizer in the place of cocktails; it takes the place of afternoon tea in many homes; it is indispensable in the culinary arts where good cookery is appreciated; it makes a splendid addition to several soups; and it is often used with pastry desserts and with coffee and nuts. The maker of wines from home vineyards can hardly expect to make a drinkable Sherry, nor are good Sherries made from American grapes. The best American Sherries are made from grapes grown in California, and though good, these, as yet, do not equal the kinds that come from Spain, where this is the chief wine made for export.

What ages of the several wines should one choose? Concerning no other character of wines does the fancy take such flights as in ascribing ages to wines. A man in most matters honest as the day is long often becomes a veritable Munchausen in dilating on the age of the wine in his cellar, especially if his stock is old and goes back to his father's time. Few makers of wines in a home winery are tempted to brag about the age of the wines in their cellars, but all ought to know how long it will take them to come to their best estate and how long they will remain good. He ought to know, too, that in the matter of aging there are several conditions to be regulated when one lays down the bottles of a vintage.

There is a great difference in taste in regard to what age is best for a wine. Some good judges of wine like a vigorous, young wine, or one of moderate age, better than the peaceful, subdued, ancient vintages, with all their charms for the palate and the nostrils,

which epicures so generally prefer. To the author, it seems rather better to forget all about the age of the wine one is drinking and judge it wholly by its taste and aroma; if these attributes of a wine are pleasing, the age does not matter.

American wines, very especially those made in a home winery, mature much more quickly than those made in Europe, the best ages varying greatly with the different native species. Wines from none of our native grapes retain the peak of flavor and bouquet quite as long as those made from Viniferas in Europe or California. Those who make their own wines should view quick maturity in peace of mind, for a wine which requires a quarter or a half a lifetime to come to its best estate will not be contemplated with equanimity in this hurried age. One makes wines for his own use, not to lay down for his children or grandchildren.

Wine-makers the world over have tried to find means to age wines in other ways than the passage of years. Madeira, as everybody knows, is sent on long voyages to bring it to quick maturity. Some wines are heated in specially designed buildings in the island of Madeira to age them, as, of course Sherry is in California; or, in Spain, it is left for a summer in the hot sun to age it and give it its characteristic flavor. Violent shakings and vibrations caused by trains or street cars have been tried without much success. Chemists, followed by some wine-makers, have tried to age and give Sherry flavor by pumping steam and air through hogsheads of white wine. The less a maker of wine in the home winery tries to use these methods to mature his wines, the better his product will be.

White, dry wines made in eastern America from native grapes should be ready to drink in two or three years from bottling; are at their best at four or five years; and are usually senile, flat, inanimate, or vinegary when older than ten years. It requires a little more time for dry, red wines to come to full prime, but at fifteen years most of them begin to go bad. Sweet wines, both white and red, may be kept twice as long as dry wines made from the same grapes, though some of them will be flat at an earlier

age. All who have made and kept wine, or who have bought it and kept it, are familiar with the signs of old age.

In concluding this discussion of what to serve—of what every man should have in a well-stocked cellar—thirteen wines are named as indispensables in the first column in Table VI. (No American winery, commercial or home, can make these wines, so the names are all those of types.)

TABLE VI

TYPE OF WINE	TASTE	COLOR	TEMPERA-TURE TO SERVE	ALCO-HOLIC CON-TENT—% BY VOL.	CHIEF USE	WHEN SERVED
Champagne	Dry or Sweet	Pale Gold	Cold, 40°	12	Festive Occasions	Entree or Roast
Sparkling Burgundy	Medium Sweet	Ruby	Cold, 45°	12	Festive Occasions	Entree or Roast
Rhine Wine	Tart	Amber	Cold, 50°	12	Table, Cooking	Fish and Entree
Sauternes	Dry or Sweet	Amber	Cold, 50°	12	Table, Cooking	Entree
Chablis	Semi-dry	Amber	Cold, 50°	12	Table	Fish and Entree
Burgundy	Dry	Ruby	Room	12	Table	Entree and Roast
Claret	Dry	Red	Room	12	Table, Punches	Entree
Sherry	Dry or Sweet	Amber	Cool	20	Before Dinner, Cooking	Before, during and after meals
Port	Sweet	Ruby	Cool	18	Table, Cooking	Dessert and after dinner
Catawba	Sweet	Amber	Cool	18	Beverage	After dinner
MuscateL	Sweet	Amber	Cool	18	As a cocktail and with coffee	After dinner
Tokay	Sweet	Amber	Cool	18	After dinner	Dessert

This table has been taken from a circular advertising eastern American wines. Perhaps a dozen other American wine-makers have furnished similar tables, all varying in minor details only.

ALLIANCES OF WINE AND FOODS

Perhaps it is well to begin with negatives—to mention certain foods with which all wines are misalliances, foods that spoil any wine. These are, almost without exceptions: All condiments; as

Menu

SHERRY

Cape Cod oysters

California olives Celery Radishes Salted almonds

WHITE WINES

Fillet of sea bass, lobster sauce

Potatoes with parsley

Fresh mushrooms under glass, Eugenie

RED WINES

Escalope of lamb, Colbert

Asparagus tips with cheese, browned

Santa Barbara grape-fruit

AMERICAN CHAMPAGNE

Breast of chicken stuffed, deviled sauce

Long Island salad

SWEET WINE

Plombière of chestnuts

Assorted cakes

Coffee

Wine List

Angelus Sherry

Superior Sherry

WHITE WINES

Cerrito, Sauterne type
Sauterne, Souvenir
Delaware
Cabinet Riesling

Cabinet Riesling
Château Pacheteau Sauterne
Coronado Sauterne
Sauterne, Yquem type

RED WINES

Typo Red
Columbia Claret
Margaux Souvenir
La Loma, Burgundy type

Coronado Burgundy
Cabernet Lafite
Château Gundlach
Château Pacheteau Cabernet
Burgundy, Special

CHAMPAGNES

Brotherhood, Extra Dry
Brut Curvée
Grand Imperial Sec
Great Western Special Reserve and
 Brut
Gilt Edge
Golden State

White Top, Club Special

Golden Age
Gold Seal, Special Dry and Brut,
 1908
Paul Masson, 1908
Paul Garrett, Special
Roualet Dry, Imperial
State Seal

Gold Seal, Sparkling Burgundy

Brotherhood, Sparkling Burgundy

SWEET WINES

Virginia Dare

California Fruit Cordial

*Guests may order free of charge any of the above brands of Wine but they will
be served only with the proper course*

vinegar, mustard, curry, horseradish, Worcestershire sauce, mint sauce, tabasco sauce, chutney, and pickles, sweet or sour.

Then there is a rather long list of foods that never make any wine taste better: No pickled or smoked fish, as herring, sardines, salt mackerel, or finnan haddie are foods to associate too closely with wine—to be eaten just before or just after taking a sip of wine. Neither should one expect to get the best out of a wine when he is eating such strong-tasting vegetables as onions, radishes, or green peppers—or highly seasoned soups, even clear soup. Wines do not go particularly well with salads, especially if a French dressing has been used. One doesn't ordinarily sip a wine with most vegetables, though a white wine and artichokes complement each other very well. Nor do molasses, syrups, or candies make a wine taste better, but rather the reverse.

One hears the impatient hostess interject: 'What in the name of goodness can one serve with wine?' The man who loves his food exclaims: 'What balderdash! Food is more important than wine.' The author can only plead that he is chiefly concerned with wine and good wine, and is writing with that in mind. Well, of course, there are all the shell fishes and fish from salt or fresh waters; nearly all meats, whether from domesticated animals and fowls or those from the wild, some pork foods being exceptions; all cheeses; and breads, cakes, pastry and all starchy foods. In the next chapter, recipes for wines used in cookery are given. These will show most of the good alliances that can be made between wines and food.

For some fifteen or more years before Prohibition, the American Wine Growers' Association met for its winter meeting at the Waldorf-Astoria, then considered the best place in America for good food and good wines. The dinners were planned by, or at least the menus had to pass the eyes of, Oscar of the Waldorf, one of the world's famous chefs. The wines, of course, were the chief feature of the dinners. It is interesting to see what foods Oscar chose to give the wines a good background. On 9 March 1914, the menu reproduced on pages 272-3 was served. All the wines served were made in America.

ALLIANCES OF WINES WITH WINES AND FOODS

The books on wines and wine-makers' advertisements of a generation ago attached much importance to the kinds of wine to be served together and the order in which they should be served. Here, again, there is a good deal of hocus-pocus. Nothing is sacred about a wine; there is nothing to prevent one's drinking them when and with what and in what order he pleases. Still, almost instinctively, one knows as he becomes familiar with wine that some alliances are better than others. The novice may be helped a good deal—given assurance at least—if he has a few simple rules, to which, later, he will wonder why he ever gave attention. At any rate here they are:

1. Serve dry wines before sweet wines.
2. Serve white wines before red wines.
3. Serve white wines with white meats and all sea foods.
4. Serve red wines with all red meats.
5. Serve Burgundy or Chianti with game.
6. Serve sweet wines with dessert.
7. Champagne may be served with sea food or dessert.
8. A variety of wines is not necessary with an ordinary dinner.
9. Sherry may take the place of cocktails and may be used to flavor some soups.

No one, seeking to get the most pleasure out of wine, will indulge in too many cocktails before a dinner is served. They should be taken with *hors d'œuvres* and there should be a decent time between the last cocktail and the first glass of wine. No one who wishes to enjoy a good wine will sip it between puffs of a cigarette—better still, 'no smoking' at a meal in which choice wines are being served.

TEMPERATURE

The true flavors and bouquet of a good vintage cannot be savored if the wine is too cold or too warm. Wine-drinkers soon learn by experience the temperatures at which they like best the

different wines that come to their tables. There are a few general rules, however, upon which all agree.

The taste and aroma of red wines, dry or sweet, is best at room temperature, which they should reach by standing in kitchen or dining-room several hours. To stand any of the red wines near a fire, or to plunge them in warm water, upsets all the harmony of sweetness, acidity, and alcohol which has been gained by years of patient standing in the wine-cellar, and in a few minutes destroys much of the charm of the wine. There are those who like a Burgundy or a Claret at cellar temperature, and, if so, at that temperature they should drink them. It is perfectly permissible to hold a glass of these red wines in the hand and gently chafe them until the wine has the body's warmth communicated to them, at which time taste and aroma should be as nearly perfect as is possible to attain.

White wines are at their best at a much lower temperature than that prescribed for the reds. Every wine-drinker likes a definite feeling of coldness when a white wine touches his lips, whether it is still or sparkling. Americans like white wines colder than do Europeans, who bring them straight from a cool cellar, while in this country they are usually chilled in the refrigerator. Anyone, however, who chills a wine by putting ice in it ruins taste and aroma—a worse procedure than putting a red wine on a stove ‘to take the chill off.’

The fourth column in Table vi, page 271, gives a summary of the temperatures at which wines should be served.

DRAWING THE CORK

The pleasure of drinking wine is enhanced by a great number of age-old customs. Not a few of these have their origin in an effort to compliment guests, one of which is to draw the cork of an especially good wine in the presence of those who are dining. The mouth of the bottle is carefully wiped before the cork is drawn with a fair, white napkin, and again after the cork is out. The butler, the waiter, or the host, as the case may be, draws the

cork, while the guests are adjusting their napkins before the soup is served.

Another custom sanctioned by custom is that a little wine first be poured in the host's glass. There is a reason of some moment for this procedure, namely, that if cork particles remain in the neck of the bottle they fall in this first glass. The waiter then proceeds to the right, ending by filling the host's glass.

Usually wine glasses are filled only two-thirds full so that as one sips, warming the glass with the palm of the hand, the aroma may be savored to the utmost. A good waiter, or a thoughtful host, will make sure that the guest's glass does not become empty during the meal unless it is signified that no more wine is wanted.

The most vexatious misfortune that can happen in serving wines is a broken Champagne cork. The guests are all awaiting the pleasant, resounding pop that bespeaks a sound, lively bottle of this delicious beverage. But none comes. The lower part of the cork is hard and sticks tight. One tries a corkscrew—usually unnecessary—but the point cannot be driven in the hard cork. There are tongs which slide down the sides of the cork, but they are seldom at hand. Eventually by digging with a knife and a corkscrew the cork flies out. The Champagne is a bitter draught to the host.

Champagne corks seldom or never break in the good brands of American make. When the best corks are used there is no trouble. Poor corks are used in poor Champagnes. European sparkling wines are seldom stoppered with as good corks as American makes, and one sometimes sees a cork in a good European Champagne break and stick, to the mortification of a host who may have been holding forth on how much better French Champagnes are than those made in America.

One awaits to see how wine bottles will be stoppered in the future. It is to be expected that sweet wines, some dry wines, and all wines in gallon containers will be stoppered with screw caps. The wine epicure will miss the corks, troublesome as they sometimes are, and will have, if possible, only wines kept in bottles by corks. If wines are to be aged in bottles, there is some little

advantage in cork stoppers, through which the wine may be said to breathe, faintly though it be. No doubt the common run of commercial wines will be quite as good in bottles with screw caps, and no doubt such stoppers are much more convenient and a trifle less expensive in cost and labor.

The sooner a dry wine is used after a bottle is opened the better. Everyone knows that this is the case with sparkling wines, which lose all their pearly bubbles in the course of three-quarters of an hour; but it is true to a certain extent of any dry wine. The best dry white wines are very ephemeral and lose their goodness hour by hour, until at the end of twenty-four hours a really fine wine is but mediocre. Most dry wines begin to discolor when the bottle has been open a day. Some say that white wines may be kept longer after the bottle has been opened than may red ones. It is doubtful if there is much difference. Ports, Sherries, and sweet wines in general may be left in open bottles a week, a month, or, recorked, years. However, it is better not to trust luck too long with sweet wines in an opened bottle; at any rate, recork tightly.

DECANTING

When wine is poured from the bottle into a glass it should be as clear and bright as crystal. Wines good enough to store and age begin early to rid themselves of impurities, which sink down on the sides of the bottles. The deposit of sediment should never find its way back in the wine. Good wines need a tranquil storage place and should at all times be carefully handled. In storage the bottles lie on their sides, and some use a basket cradle to keep the bottle in a horizontal position when the wine is served. It is doubtful if this cradle often serves its purpose well. Others decant, that is, gently pour the wine from the original bottle into a decanter from which it is served at the table.

Decanting is too troublesome and does not always separate the wine from its sediment. To the author, a wine poured from the bottle into a decanter is never quite as good as when it is poured from the original container. Besides, most wine-lovers like to see a cobwebby bottle and a faded label. Some old red wines have so

much sediment that they either must be decanted, or, better, stood upright for a day or two until the sediment settles to the bottom; the wine is then poured in the glasses with a steady hand, leaving an inch or two of wine and sediment.

Decanting is an art in itself. The decanter must be clean, dry, and as warm as the room. In pouring from the bottle, use a wine-strainer covered with filter paper or thin cotton-wool spread evenly over the strainer. As the sediment is approached, pour slowly. Leave the decanter unstoppered for an hour or two before serving.

WINE GLASSES

Much ado is made over the proper wine glasses in which to serve different wines. To a peasant in Europe or an Italian workman in America, the kind of glass out of which he drinks wine is of small moment, just so it holds enough. The epicure, who can afford good wines, pays as much attention to the glasses as he does to the silverware, china, and napery on his table. Happily, wine-drinkers, the world over, who are accustomed to the best in their table service, agree pretty well on the kind of glasses for different wines.

Connoisseurs are in accord in preferring perfectly plain glasses and do not use fancy glasses of any kind. They like their wines served in thin, crystal-clear glasses, that they may see and judge the color of the wine they are drinking, the color of the wine giving much more pleasure than any color of the glass. Red, green, purple, gold-banded, and glasses with figures of these colors, may be purchased here or abroad, often at considerable cost, but they are seldom found on the tables of epicures. One sees occasionally cut-glass wine glasses, which, if cut so that the color of the wine is seen perfectly well, are very good.

Another prime requisite of a wine glass is that it should be large. For a dry table wine, the glass should hold a half pint, or a trifle less—nearly as much as the ordinary breakfast coffee cup. Such a glass, stem and bowl, stands five or six inches high. A glass for Ports, Sherries, Tokays, and all sweet wines may hold a little

less. Glasses of these sizes should never be filled much more than half full.

Why so large? Why filled only half full? One familiar with good wines likes to hold the glass up so that he may see the color, then to twirl it around so that the wine washes the inner wall of the glass, so that he may better get its aroma—the bouquet so much prized by epicures. The bouquet becomes more distinct and agreeable if the bowl is warmed by being held in the palm of the hand a few seconds.

All this sounds very ostentatious. Really, however, it may be done so quickly and so inconspicuously that fellow drinkers hardly know that it is being done, or has been done. Certainly it is less conspicuous and less unseemly than to throw the head back and gulp the contents of the glass down in two or three swallows, as one sees done in any restaurant and must occasionally endure at his own table.

The shape of wine glass is important, if one is to enjoy color, bouquet, and taste to the full. The best shape is that of an open tulip, a beautifully curving bowl the bottom of which is a part of a globe growing narrow at the top so that the bouquet passes to the nostrils through a rather small opening. The glass for any wine should be well balanced and have a stem. In drinking wine one always sips and never gulps. Sipping requires that the glass be often lifted and set down. This is best done with a glass having a stem. Lifting a stemless glass does not permit one to see the color clearly.

One commonly sees three rather distinctive types of Champagne glasses. A few years ago, the most popular glass for a sparkling wine was a tall stemmed glass with a tulip-shaped bowl, the stem being hollow. A second type was of the same shape and size—holding a half pint—but with a solid stem. Now one often sees glasses for sparkling wine with bowls of flat saucers. The first is the best. The wine bubbling in the stem is a pretty thing to see, and by actual test, it bubbles longer. Some epicures prefer solid stems. The saucer-shaped glass is the poorest, providing the shortest period of bubbling and the least bouquet.

THE STORAGE PLACE

Americans in general buy wine as they need it, a few bottles at a time. More and more, however, are becoming collectors of good wines. Collectors and those making wine from a garden vineyard need a 'wine cellar' or at least a place where a few dozens of bottles can be stored. Such a storage place has four major requirements.

First, the room should be as dark as pitch. No wine keeps well in sunlight or even shaded light.

Second, the room must be cool. This holy of holies for the collector or maker of wines should be as near 50° as one can keep it, a few degrees more rather than less.

Third, the room should be relatively dry, otherwise labels will come off and corks will rot. The dryness must not be maintained with artificial heat, which is quite too uncertain, but, rather, by the use of calcium chloride in one of several inexpensive air-dryettes now to be had in the markets.

Fourth, provision must be made for keeping the bottles in a horizontal position so that corks or caps are kept moist and tight, thereby keeping out the air.

These conditions can be filled usually only in a cool dry cellar, but in these days of apartments and small houses heated by central heat few have cool cellars. Often an upstairs closet can be insulated and kept cool. Or, it may be that a pantry shelf or a rack of shelves in some corner of the house will have to suffice. The names of the bottles will often be hidden, so that there should be room on the edges of shelves in each bin section for a label. The shelves should be made so that the necks of bottles can be kept a little lower than the bases. Store Champagne on the lowest shelf, which is coolest, then white table wines, then red wines, with sweet wines at the top.

23. Wine Drinks

'Good wine needs no bush' is a proverb quoted by Shakespeare. The proverb came, we are told, from the old custom of hanging a branch of a tree as a tavern sign. If a wine needs no bush, it is just as true that it needs no other ingredients to improve it. Indeed, it is a sacrilege, a violation of an almost sacred thing, to use a rare wine in any of the recipes found in this chapter.

But there are wines and wines, good, bad, and indifferent, a good many that need other ingredients to make them drinkable. Then, too, there are occasions when a glass, a cup, a punch, a mulled wine, a cobbler, or a flip is really more to one's liking than a glass of wine; so, too, one often finds a punch or a cup more suitable for a gathering of friends than bottles of wine would be. Lastly, wines from a home winery, whether because of a poor season or bad luck in making, can often be used with greater pleasure in an admixture than alone.

WINE COBBLERS

The word cobbler brings to mind the favorite dish of one's boyhood, a fruit-pie baked in a large deep dish lined with thick dough, eaten with an abundance of spiced, sweetened milk. That, however, is not the cobbler of this page. What is in mind now is a delectable long drink, slowly sipped. There is nothing in the whole world better for an afternoon or evening of the several weeks of dog days.

The common everyday cobbler is one of the easiest of all drinks to make.

Fill a tall glass with fine ice and add a wine glass of any wine; sweeten with a teaspoonful of sugar, or to taste; decorate with a slice of lemon, orange, or mint. One may use any sweet or still wine remembering that sweet wines will not need the addition of sugar. With skill in stirring, the glass may be frosted as in making mint juleps. Sip slowly with straws.

A pleasing variation of wine cobbler is wine-lemonade. This is made by adding half as much lemon juice as wine. A little water should first be added to the ice, then the sugar, which should be dissolved before the lemon juice is added. The wine should be poured in last, to float on top of the lemonade.

Still another variation is wine and soda. Half fill a tall glass with fine ice and any wine you may choose. Sweeten to taste, and fill with any sparkling water. The juice of half a lemon or a lime may be added. A few drops of bitters might suit some tastes.

A specific recipe for a Sherry Cobbler serves as a model for any wine cobbler. Half fill a tall glass with crushed ice. Add 1 teaspoon sugar and 2 Sherry glasses of Sherry. Stir well. Garnish with a Maraschino cherry, a slice of orange or lemon, and a cube of pineapple if desired. Serve with straws. Serves one.

A claret cooler is one of the many varieties of wine cobblers. Here is the recipe:

Put a generous slice of lemon in a tall glass, smother with a heaping teaspoonful of sugar, on which drop four cubes of ice. Fill the glass $\frac{3}{4}$ full of Claret (Burgundy or a dry white wine will do as well), and fill with sparkling water or ginger ale.

Were it winter, straight wine would be agreeable, but for a hot day, sparkling water makes the best cooler.

WINE COCKTAILS

Cocktails were long purely American drinks but are now used the world over where liquors are served. For the most part they are made of distilled liquors with additions of aromatic and stimulating liqueurs, as vermouth, and sometimes lemon, sugar, or bitters. Two wines, Champagne and Sherry, make very good cocktails.

To the author, any use of a good Champagne other than drinking it as it comes from the bottle is sacrilege. If someone should

give you a bottle of 'carbonated Champagne,' however, you might use it as follows:

CHAMPAGNE COCKTAIL

Put a cube of sugar in a glass of Champagne; add a dash of bitters and a twist of lemon peel.

CHAMPAGNE COCKTAIL FOR FOUR PEOPLE

Juice of one lime, one lemon, one orange. Four tablespoons raspberry syrup. One wine glass of gin. Mix and divide into four tall glasses filled with cracked ice. Fill with Champagne and stir lightly with a spoon.

In the days of World War II, because of the expense of distilled liquors, often not obtainable at any price, Sherry cocktails became more and more common. Most often the Sherry is served alone or with a few dashes of bitters, making a very acceptable appetizer. If the Sherry is dry it should be served cold or with ice. Sweet Sherries are served at room temperature.

SHERRY COCKTAIL

A very good cocktail is made by mixing three parts of a dry Sherry with one part of dry Vermouth, adding three dashes of bitters, after which it is strained into a cocktail glass and a twist of orange peel is added.

SHERRY OLD-FASHION

In an Old-Fashion glass put about $\frac{1}{2}$ teaspoon sugar, 3 dashes bitters, a twist of lemon peel. Pour in 2 Sherry glasses of Sherry. Add a couple of ice cubes, garnish with a Maraschino cherry, and serve immediately. Serves one.

WINE CUPS

A wine cup is made of sweetened, iced wine, flavored according to many recipes and containing a variety of ingredients. The different varieties are named from the wine used, as Champagne-cup, Claret-cup, Sauterne-cup, or Moselle-cup. Only dry wines are used in making wine cups. They may be served from a punch bowl or a large pitcher. In the making of no other wine drink is greater art displayed than in a wine cup—happy should be the hostess who can serve a really good one. The following are a very few of the recipes in common use.

CLARET CUP (1)

1 bottle Claret	1 liqueur glass brandy
½ sliced orange	1 liqueur glass raspberry or loganberry
½ sliced lemon	syrup if available
2 tablespoonfuls sugar	Decorate with mint

CLARET CUP (2)

1 quart Claret	Juice of 1 orange
1 pint sparkling water	1 liqueur glass brandy
Juice of 2 lemons	4 tablespoons powdered sugar

Mix well in punch bowl that has been surrounded with cracked ice. Put the sparkling wine in just before serving. Decorate with mint.

WHITE WINE CUPS

For Sauterne, or other white dry wines, proceed in the same way as in making a Claret cup.

Champagne cups may be as simple or as complicated as one has ingredients to prepare. The simple ones are best, of which the following is excellent:

CHAMPAGNE CUP (1)

To the juice of a half lemon add a liqueur glass of brandy or Curaçao. Fill the pitcher half full of cracked ice and add one quart of dry Champagne. Dress with sliced orange, pineapple, and mint.

The following is a more complicated Champagne cup:

CHAMPAGNE CUP (2)

3 slices orange	½ wine glass Brandy
3 slices lemon	½ wine glass Maraschino
1 rind of lemon	½ wine glass white Curaçao
1 slice cucumber peel	1 wine glass Sherry
1 teaspoonful bitters	1 quart Champagne
	1 bottle soda water

Add 2 or 3 lumps of ice; ornament with fresh mint or fruit. This recipe should serve ten or twelve people.

WINE FLIPS

A flip is a mixture of ale, beer, or wine, sweetened and spiced, to which a whipped egg is added. Flips may be served with ice or steaming hot. The flips of literature (to which there are many references by English authors) were always hot, made so by

plunging a hot iron into the liquor which gave it a burnt taste. A red-hot poker could be used, but there was, a century or so ago, a poker-shaped iron called a *flip-dog* in common use in English taverns and homes. The hot flip is a winter drink more suited to the chilly rooms of England than to American drinking places or homes. Making and drinking a wine-flip is a mild adventure which might be worth trying on a winter night, or after a few hours of skiing on a cold day.

Any wine, red or white, dry or sweet, may be used in making flips. For each person take one and a half glasses of wine and one egg; sweeten to taste; whip the eggs and mix them with the wine, shake thoroughly, then heat slowly, or plunge in the hot flip-dog. Do not let the mixture boil! Sprinkle nutmeg on the top.

If a cold wine-flip sounds better, pour the mixture in a glass of fine ice. Whether hot or cold, in mixing wine and eggs, pour the wine very slowly over the eggs, stirring vigorously.

MULLED WINES

A mulled drink of ale or wine is spiced, sweetened, and served very hot. Mulled wine is a very acceptable drink for a cold winter evening, or for those who ski and come in late in the afternoon. Burgundy, Port, Claret, or any white wine may be used and none of them needs be rare. The ordinary run of American wines coming from the home winery are quite good enough. Red wines are best.

MULLED WINE (1)

1 bottle wine	2 lemons cut very thin
1 pint boiling water	8 half-inch sticks of cinnamon
½ cup sugar or sweeten to taste	15 cloves

Boil the water, sugar, cinnamon, and cloves for 15 minutes. Heat the wine but do not let it boil. Combine the boiled mixture and the heated wine and strain. Sprinkle with nutmeg. Serve steaming hot. Made of red wine this is a beautiful and a delicious winter drink.

MULLED WINE (2)

Roast an orange before a fire or in an oven. When brown, cut it in quarters and drop the pieces, with a few cloves and 2 short sticks of cinnamon, into a small porcelain-lined vessel, and pour in 1 quart of hot Port. Add 2 teaspoon-

fuls of bitters and 6 lumps of loaf sugar. Stir well and let the mixture simmer over the fire for 30 minutes. Serve with nutmeg grated on top of stem glasses.

MULLED CLARET FOR ONE (3)

Put into a dish 4 lumps of sugar	$\frac{1}{3}$ teaspoonful cinnamon
2 dashes of lemon juice	2 cloves, bruised
4 dashes bitters	4 allspice, bruised
	2 wine glasses Claret

Allow the mixture to boil and simmer for 2 minutes, stirring continuously; strain and serve in a tumbler.

MULLED WINE (4)

$\frac{1}{3}$ cup granulated sugar, or more to taste	18 whole cloves
$\frac{1}{2}$ cup water	1 cup of strained orange juice
1 lemon, sliced	2 cups canned unsweetened pineapple juice
1 $\frac{1}{2}$ -inch stick of cinnamon	1 bottle Burgundy or Claret

Boil sugar, water, sliced lemon and spices together for 5 minutes. Then strain into double boiler and add fruit juices. When hot, add wine and continue to heat till mixture bubbles, but do not let boil. Serve very hot, garnishing glasses or cups with orange slices. Serves 8 or 10.

A pleasing variation is made as follows:

MULLED WINE (5)

$\frac{1}{3}$ cup granulated sugar, or more to taste	18 whole cloves
$\frac{1}{2}$ cup water	1 cup of strained orange juice
1 lemon, sliced	2 cups canned unsweetened pineapple juice
3-inch stick of cinnamon	1 bottle Burgundy or Claret

Boil sugar, water, sliced lemon and spices together for 5 minutes. Then strain into double boiler and add fruit juices. When hot, add wine and continue to heat till mixture bubbles, but do not let boil. Serve very hot, garnishing glasses or cups with orange slices, if desired. This recipe should serve eight or ten people.

PORT WINE NEGUS

A negus is a beverage of wine, hot water, sugar, lemon juice, and nutmeg served very hot. The drink was named after Colonel Francis Negus, of the English Army, who died in 1733.

Rind and juice of half a lemon	1 pint Port Wine
Sugar to taste	1 $\frac{1}{2}$ cups boiling water

Pare off rind of half a lemon in thin strips, put into double boiler with sugar and wine, and heat, stirring until sugar is dissolved. When hot, add boiling water, and strain into pre-heated pitcher. Serve in glasses or cups with a dash of nutmeg. Serves 4. Any other red wine can replace the Port.

THE WASSAIL BOWL

In olden days the *wassail bowl* of spiced ale and wine was carried about on Christmas, New Year's Eve, Twelfth Night, and other festive occasions. Toasts were drunk and pledges made with the wassail cup at the lips. Thus, in *Hamlet* we read: 'The king doth wake to-night and takes to rouse, keeps wassail.'

Or, again, in Tennyson's *Princess*: 'We did—but pledge you all in Wassail.'

Still again, in Longfellow's *Skeleton in Armor*: 'Many a wassail-bout wore the long winter out.'

The two recipes that follow sound most festive, though it is to be presumed that the contents of a wassail bowl may be as varied as the people who prepare it or as ingredients permit. In the admirable *Wine and Food Newsletter* which used to come from Greig, Lawrence & Hoyt, wine and spirit merchants of New York City, is this recipe for a wassail bowl:

WASSAIL BOWL

To one quart of Ale, add one-quarter ounce each of grated nutmeg, ginger, and cinnamon, with half a bottle of Sherry, two good slices of toasted bread, juice and peel of one lemon, and two well-roasted apples. Sweeten to taste. Put the Ale in a saucepan and cook gently until it foams, then stir in the spices. Add the Sherry, lemon peel and juice with the sugar, and when the latter is melted, set the pan aside on the stove for twenty minutes to infuse. Then warm up, pour into the punch bowl, let the toast and apples float in it, and serve in cups.

And then there is the rather gorgeous wassail bowl of Sir Walter Scott.

SIR WALTER SCOTT'S WASSAIL BOWL

Place one pound of sponge cake and of macaroons in a bowl, add a wine glass of Sherry, two bottles of raisin wine, one bottle of Champagne, one bottle of Chablis, and a touch of lemon juice. Serve steaming hot.

Another Christmas drink, somewhat on the order of the Wassail Bowl is Rumfustian, a name preserved to us in old books of recipes. Hardy drinkers might safely drink it, but for most moderns it makes the head go round and furrs the tongue to see the list of ingredients in print. The following recipe is also from Peter Greig's *Wine and Food Newsletter*:

RUMFUSTIAN

'Put half a bottle of Sherry in a saucepan, add cinnamon, grated nutmeg, rind of lemon and sugar. Keep on the fire until about boiling, during which time you whisk up the yolks of three eggs with one pint of Ale and . . . half a pint of Gin. (Mercy!) When ready, pore the Sherry mixture in through a strainer, stir well and shervethebow.'

PUNCHES

Punch is a generic name for a great number of drinks, commonly but not always containing wine or spirits. It is usually named from the alcoholic liquor which it contains; as, Claret-punch, Champagne-punch, Burgundy-punch, brandy-punch, and so on. Sometimes the name comes from other ingredients; as, tea-punch, milk-punch; or a country, as Swedish-punch, or Roman-punch; still, again, the name comes from that of a man, or perhaps a place in which it originated; as Waldorf-punch, Cambridge-punch. One sees at once that the recipes for punches run into high numbers, of which but a few for typical wine-punches are given.

ARTILLERY PUNCH

$\frac{1}{2}$ lb. sugar or more to taste	1 quart Claret
Juice of 6 lemons	1 quart Sherry
2 tablespoonfuls bitters	1 quart Scotch whiskey
1 quart brandy	

Mix well, and pour into another bowl in which a block of clear ice has been placed. Pour in 1 quart of Apollinaris and serve in punch glasses or cups. This recipe should suffice for about forty people.

BLACK VELVET PUNCH

$\frac{1}{4}$ lb. white sugar, or more to taste	1 teaspoonful bitters
Juice of 6 lemons	1 quart Guinness stout
1 quart Champagne	

Pour the Champagne and stout into the well-mixed lemon juice, sugar. Ice cold. Serve in punch glasses dressed with fruit. This recipe will serve ten or twelve people.

BROWN VELVET PUNCH

$\frac{1}{2}$ lb. white sugar, or more to taste	1 tablespoonful bitters
Juice of 6 lemons	1 quart Claret
1 pint Port	

Pack bowl in fine ice, and when contents are very cold, add 1 quart of Champagne. Serve in punch glasses or cups dressed with fruit.

Wine Drinks**BURGUNDY PUNCH**

Use large glass pitcher, into which put:

1 liqueur glass of brandy	1 liqueur glass Maraschino
1 liqueur glass brown Curaçao	1 quart Burgundy
1 long cube ice	

Stir well and decorate with:

1 lemon, sliced	Maraschino cherries and 1 small
5 or 6 pieces of pineapple	bunch of green mint on top
1 orange, sliced	

This quantity should serve six people.

CHAMPAGNE PUNCH (1)

Squeeze the juice from six ripe oranges, add half a pint of Maraschino, one pint of brandy and six quarts of dry Champagne. Ornament the punch bowl with sliced pineapple and oranges.

CHAMPAGNE PUNCH (2)

Place a medium size can of shredded pineapple, one bottle Sauterne, and one bottle of Burgundy in earthen dish; keep in refrigerator at least twenty-four hours. When ready to serve remove contents to punch bowl; add one large lump of ice and one bottle Champagne.

CHAMPAGNE PUNCH (3)

½ lb. powdered sugar	1 glass brandy
2 quarts Champagne	1 glass Maraschino
1 quart sparkling mineral water	1 glass Curaçao

Mix well in punch bowl that has been surrounded with cracked ice. A spiral of cucumber rind gives this punch a distinctive flavor.

CHAMPAGNE PUNCH (4)

2 tablespoonfuls of sugar	3 lemons, sliced
1 teaspoonful bitters	1 pineapple, sliced and quartered
3 oranges, sliced	2 bottles of Champagne
2 bottles of soda water	

Stir gently in a large punch bowl; put in a block of ice. This recipe should serve twenty people.

CHAMPAGNE PUNCH (5)

A favorite Champagne Punch is made as follows:

3 bottles Champagne	1 bottle Sherry
1 bottle dry Sauterne	1 bottle brandy

Sparkling Burgundy may be substituted for Champagne. Rum may be substituted for Sherry. Fruit juices of any kind spoil this punch.

CLARET PUNCH (1)

Juice of 6 lemons	Sugar to taste
4 liqueur glasses brandy	2 liqueur glasses Curaçao
2 quarts of Claret	2 dashes Benedictine
2 quarts of Apollinaris	

Dress with a few slices of lemon and orange, a slice of pineapple and mint. This recipe should make one gallon of punch, which should serve 20 people.

CLARET PUNCH (2)

2 quarts Claret or Burgundy	2 liqueur glasses Jamaica rum
Juice of 1 lemon	Sweeten to taste

Block of ice. Dress with slices of orange, lemon, or pineapple. This recipe should serve 10 people.

CLARET PUNCH (3)

3 tablespoonfuls syrup	3 lemons, sliced
1 tablespoonful bitters	1 pineapple, sliced and quartered
3 oranges, sliced	2 wine glasses brandy
	2 bottles Claret

Mix in a punch bowl and cool with a large block of ice. This recipe should serve twelve people.

CLARET PUNCH (4)

Boil together for 5 minutes

½ cup sugar	6 strips of lemon peel
¾ cup water	12 cloves
3 inches stick cinnamon	

Strain, cool; add

1 cup orange juice	½ cup lemon juice
1 cup canned unsweetened pineapple juice	1 bottle Claret

1½ cups carbonated water

Pour over block of ice in punch bowl. Float orange and lemon slices on top. Should serve 10 or 12 people.

CLARET PUNCH (5)

2 quarts of Claret or Burgundy	3 oranges, sliced
1 pint rum	1 lemon, sliced
1 pint Champagne	½ pineapple, sliced
1 pint brandy	1 wine glass Vermouth
2 quarts sparkling water	Block of ice

This recipe should serve twenty to thirty people.

Wine Drinks

PARTY PUNCH

Boil together for 5 minutes.

$\frac{1}{2}$ cup sugar	6 strips lemon peel
$\frac{3}{4}$ cup water	12 cloves
	3 sticks cinnamon

Strain, cool; add

1 cup orange juice	$\frac{1}{2}$ cup lemon juice
1 cup canned unsweetened pineapple juice	1 bottle Claret or Burgundy
	1 $\frac{1}{2}$ cups carbonated water

Pour over block of ice in punch bowl. Float orange and lemon sliced on top. Makes 2 quarts, 8 large or 16 small glasses.

WHITE WINE PUNCH (1)

Juice of 4 to 6 lemons	Sugar to taste
2 dashes yellow Chartreuse	2 liqueur glasses brandy
2 quarts white wine	1 liqueur glass pineapple juice
	2 quarts sparkling water

WHITE WINE PUNCH (2)

Juice of 8 lemons	Sugar to taste
2 liqueur glasses of Curaçao	2 liqueur glasses of brandy
2 quarts white wine	1 liqueur glass of Benedictine
	2 quarts sparkling water

WHITE WINE PUNCH (3)

1 liqueur glass brandy	2 liqueur glasses lemon juice
1 liqueur glass Benedictine	1 liqueur glass Curaçao
2 quarts white wine	1 lemon, sliced
Maraschino cherries	4 slices pineapple
1 orange, sliced	2 quarts sparkling water

Stir well and put 1 bunch of green mint on top.

WHITE WINE PUNCH (4)

1 liqueur glass brandy	1 orange, sliced
2 quarts white wine	2 liqueur glasses Maraschino
6 or 8 cherries or grapes	2 quarts of sparkling water
2 lemons, sliced	1 bunch of green mint

Stir well and serve.

WHITE WINE PUNCH (5)

5 bottles Dry Sauterne	$\frac{3}{4}$ pint syrup (made of 4 parts water to 1 of sugar boiled only until sugar dissolves)
1 pint brandy	
1 pint rum	
	$\frac{1}{6}$ pint Benedictine

Fruit juices would spoil this punch. Serves 20.

GOLDEN PUNCH

Dissolve $\frac{1}{2}$ cup sugar in 4 cups hot tea; cool. Add $\frac{3}{4}$ cup lemon juice and 6 cups Sauterne or white table wine. Serve poured over block of ice in punch bowl. Makes 24 small glasses.

These six recipes are but samples of many that could be given for white wine punches. They might we varied almost infinitely as to kinds and amounts of ingredients. Almost any of the several common liqueurs may be used in varying amounts in white wine punches. Besides the citrus fruits and pineapples, sliced pears, strawberries, raspberries, loganberries, either fresh or canned, in small amounts or as decoration, make agreeable variations. A few thin slices of cucumber give a distinctive and pleasing flavor.

Though to many a punch is not a punch without some fruit flavor, the author prefers all punches without a fruit-juice base. The objection to fruit juices of any kind is that the punch is not so smooth to the taste, is cloudy in color, and for many people is too sweet.

All punches are served in a punch bowl or a very large pitcher. All are served cold, cooled in a refrigerator or with a block of ice, or both. A gallon of any of these punches should serve 15 or 20 people. One may substitute ginger ale for the sparkling water in any of these punches; or, a good many people would prefer a quart of tea. Some makers of punches add an orange or other fruit ice. For a weaker punch, sparkling water can be added to any recipe. As the reader will see, the combination of ingredients for wine punches are almost innumerable. An ingenious hostess can experiment to her heart's desire, possibly creating in the end a punch that is the envy of all her friends.

POSSET

Posset, so often mentioned in literature a century or two ago—a favorite word with Shakespeare both as a noun and a verb—is a mixture of wine, milk, sugar, and spices, in which the milk is curdled, or even coagulated. It is a cold weather drink, made by mixing hot wine with sugar and spices to taste. The proportions of wine and milk are varied to suit the taste.

WINE EGG-NOG

Egg-nog, so popular as a New Year's drink, may be made of wine as well as of whiskey or brandy. More important is its use as a rich, nutritious, easily digested food and drink for invalids. Any sweet wine, red or white, may be used, of which Sherry is the best. The following is a good recipe for one glass of Sherry egg-nog:

The yolk of an egg is thoroughly mixed with a tablespoon of sugar, two or three tablespoons of Sherry, and lastly, a half pint of rich milk is added. The white of the egg may be used to make a froth. Serve very cold.

SANGAREE

A warm weather drink, once very popular and still common in tropical countries, is Sangaree. The name comes from the same root as *sanguine*, pertaining to blood; hence the base of Sangaree is a red wine, varieties of the drink being *Claret Sangaree*, *Port Sangaree*, and so on, through the whole list of red wines.

To make a Sangaree, red wine is diluted to taste with water, lemonade, or a sparkling water, and is invariably flavored with nutmeg.

24. Wine in Cookery

THE French, all concede, are supreme in cookery. The meals of French chefs in good standing are incomparable, if artistic perfection be the gauge. It is not too much to say that the culinary accomplishments of Frenchmen in public eating places and in homes of rich and poor are largely due to the free use of wine. Not only is wine used as an accompaniment of food, but it is a principal enrichment in preparing the dishes so famous in the French cuisine.

In no other part of the world are good honest foods and table delicacies alike more common than in America. North America is a natural garden in which varied climates and soils, in one part or another of the continent, permit the culture of nearly every farm crop, vegetable, and fruit known in the art of cookery. In one place or another, most of the edible animals and fowls, wild or domesticated, may be had for the table. Sea foods from salt and fresh waters are everywhere abundant. Quick transportation brings all these aliments to everyman's door. In variety and quantity of raw food products, no other country surpasses the United States, and possibly only in France is more wholesome and more delectable food served at table. If, perhaps, in America cookery wines were used as freely as they are in France, we might hope that our cuisine would in time approach that of the older country.

Wines are not greatly used in American kitchens for several obvious reasons. Chief of these is that American cooks, in public and domestic eating places, do not know wines and are not accustomed to their use. Another is that wines are too expensive for use in cookery. And, of course, there is and has been for a century

or more the bogey of Prohibition, to which the authors of cookbooks seem to have catered.

Now, with the more general use of wines, with the advent of home wine-making, and with Prohibition scotched, it would seem that wine might come into more common use in cookery. It would help greatly to stimulate the use of wine, if the wine industry would sell at a lower rate wine for culinary uses than for table uses. It would be a further help if cookbooks contained more recipes for foods prepared with wines; as, perhaps, they are doing. And then, of course, those who make their own wines should lay aside some for kitchen use.

The recipes that follow are a part of a collection the author has been making for years. Nearly all, if not all, come from the wine advertisements of various wine companies, from wine papers, and household magazines. So many have come or have been adapted from the *Hostess Book*, printed by the California Wine Advisory Board, 85 Second Street, San Francisco, that especial acknowledgment must be made. Few, or none, have come from cookbooks, and a look through several of these shows that many might have been added from them. These recipes are intended to serve merely as an introduction to a subject too widely neglected by those in this country who write about the preparation of foods.

Wine is chiefly used in foods to season and flavor. There are few dishes a cook can serve that are not improved by an addition of wine of some kind. In day-by-day cooking, wine can usually be used without a recipe—one adds it just as one would any other seasoning. It must not be supposed that wine is to be used only in fancy dishes. Try it with almost any cheap cut of meat; with any meat to be warmed up to serve over; roast chicken, turkey, or any game bird is much better when basted with a red wine; the delicate flavors of fish are brought out by a white wine. A little wine on prosaic baked beans is a great improvement.

APPETIZERS IN GENERAL

As we are so often told, good digestion waits on appetite and health on both. Whether or not this is the reason, cocktails, *hors*

d'oeuvres, or canapés, soup or no soup, are starting-points for most dinners of any considerable ceremony. The prime requisite of a good appetizer is, of course, that it should whet the appetite, which is best achieved by salted, or pickled, foods and by those in which pepper or paprika are used, with none of which is wine a good associate. There is, however, another equally suitable and quite as delectable class of appetizers. These are fruit cocktails, citrus fruits, some hardy fruits, and melons, with which, to be at their best, wine is almost indispensable. There are also some canapés in which wine is either a part or a good associate.

FRUIT COCKTAILS

Any fruit cocktail a hostess may care to serve is greatly improved by the addition of wine. White or red, dry or sweet, still or sparkling wines may be used, though probably Sherry, by reason of its being at hand in most households where wine is served, is most often put in a fruit cocktail to give flavor.

The author is fully aware that wine epicures say that good wines should not be served with fruit, nor does the thought of such an association make his mouth water. Accordingly, it is recommended that ordinary wines be used in making fruit cocktails, reserving fine wines for more fitting purposes.

GRAPEFRUIT COCKTAIL

3 grapefruits 3 glasses wine
 ½ pound large California grapes

Cut the grapefruits in halves and core and section in the usual way. Cut the grapes in halves and take out the seeds; place equal amounts in the center of each half grapefruit. Pour over the grapes in each half grapefruit a half glass of wine. Sweeten to taste. Any wine may be used, but a rich, sweet, topaz-colored one, made from Catawba, Iona, Diana, or Dutchess is best. Every maker of home wines should have one or more of these wines in his cellar. If served as an appetizer, bed in cracked ice.

GRAPEFRUIT AND ORANGE COCKTAIL

Mix the pulp, diced, of grapefruit and oranges, after which sprinkle sugar, flavor with lemon juice, fill cocktail glass half full, and then add dry or sweet wines. At the last moment garnish with cherries or diced pineapples.

GRAPEFRUIT AND STRAWBERRY COCKTAIL

Cut the grapefruit in half and remove the pulp. Dice the pulp, and dice several strawberries; sweeten to taste; replace in grapefruit skins, drench with wine and thoroughly chill. Dress with large, very ripe strawberries.

CHERRY COCKTAIL

Pit cherries, sweeten to taste, sprinkle with chopped almonds. Chill and put in an ice-cold glass. Pour over them whatever wine you may choose. Decorate the glasses with two or three whole cherries.

MUSKMELON AND WINE

Cut a round hole in the stem end of a large muskmelon—a honeydew is best. Remove the seeds with a spoon. Pour a pint of Sherry, Port, or Tokay wine in the melon and cool in the refrigerator for a few hours. Then pour out the wine, slice the melon, and pour the wine over the slices. A melon so prepared may be used as an appetizer before luncheon or dinner, or as a dessert.

WATERMELON AND WINE

A watermelon may be treated in the same way as a muskmelon, for a melon cocktail or a dessert, except that Claret or Burgundy should be used instead of Sherry or Port, and that a quart instead of a pint is required. This is heaven-sent pabulum—call it food or drink as you like—for a hot afternoon or evening, as well as for a meal. Try it as a start for breakfast on a hot day. If the watermelon is on the greenish side, you may as well eat gall and wormwood.

WATERMELON COCKTAIL

A very good watermelon cocktail to be served in glasses may be made as follows:

Prepare small balls of ripe red-fleshed watermelon. Add a little flavoring of lemon juice and sprinkle with sugar. Fill glasses half and half with this mixture and wine. Chill and garnish with mint. Before the glasses are filled, moisten the edges of each and invert in finely chopped mint, so that a tinge of green will adhere to the edge of the glass.

FRUITS IN WINE

One may serve almost any uncooked hardy fruit, excepting apples, in a dry, still or sparkling wine for a cocktail. Try sliced peaches, or pears, sugared strawberries, raspberries, loganberries, blackberries, ripe currants, or dead-ripe gooseberries—the last named fruit in a dry wine or Champagne will give you a new thrill in delicate feasting.

Any of these fruits drenched with a sweet wine make a most acceptable dessert. Wine, or any other drink, except mulled cider on a winter's night, is spoiled if taken with raw apples. Two or three tablespoons of a sweet wine put on a baked apple, however, make a very acceptable dessert, for which the following is a good recipe.

BAKED APPLES WITH WINE

Core 4 apples, peel upper $\frac{1}{3}$ of each. Place in casserole. Dissolve $\frac{1}{3}$ cup sugar in $\frac{1}{2}$ cup boiling water, pour over apples, cover, and bake in moderate oven 30 to 40 minutes. Remove apples to serving dishes, pour 2 tablespoons Port or Sherry wine into each. Boil down remaining syrup until fairly thick and pour over apples to glaze them. Serves 4.

FRUIT SALAD WITH WINE

Salads of pineapple, pears, peaches, grapes, grapefruit, or oranges, either diced or sliced, used either separately or in combination, make very good salads. Saturate with any sweet wine. Chill thoroughly, place on lettuce leaves and serve.

DESSERT FRUIT SALAD

3 cups mixed fruits	$\frac{1}{3}$ cup lemon juice
$\frac{1}{2}$ cup Port wine	$\frac{1}{3}$ cup honey or sugar
$\frac{1}{4}$ teaspoon salt	

Use any fruit in season, in large pieces; orange or grapefruit sections, apple slices with red peel left on, quartered pears, peach halves, grapes, berries. Combine ingredients, add to fruits, and chill. Drain, saving juice; arrange fruit on lettuce. Serve with dressing, made by blending cream cheese with enough of the drained-off juice to make a thin paste. Serves 4.

WINE DRESSINGS

SAUTERNE WINE DRESSING

1 teaspoon salt	2 teaspoons grated onion
1 teaspoon sugar	$\frac{1}{2}$ cup Sauterne
$\frac{1}{4}$ teaspoon dry mustard	$\frac{1}{4}$ cup vinegar
Dash of pepper	$\frac{1}{4}$ cup salad oil

Combine ingredients, shake or beat well just before using. Makes 1 cup dressing. Very good on lettuce.

SUPPER SALAD BOWL

1 head lettuce	4 green onions, chopped
2 tomatoes, quartered	$\frac{1}{4}$ pound sliced cold leftover meat
2 hard-cooked eggs, cut in halves	$\frac{1}{4}$ pound American cheese

Shred lettuce coarsely, place in salad bowl. Over it arrange tomatoes, eggs, chopped onion, meat cut into squares, and cheese cut into strips. Serves 4. Just before serving, pour over salad enough Sauterne wine dressing to moisten well.

RED WINE FRENCH DRESSING

1 tablespoon sugar	4 tablespoons catsup
1 teaspoon salt	4 tablespoons Claret or Burgundy
½ teaspoon dry mustard	4 tablespoons wine vinegar
1 teaspoon Worcestershire sauce	¾ cup salad oil
1 clove garlic, crushed	

Combine ingredients in order given in a pint or quart jar, and shake until thoroughly mixed. Keep in refrigerator. Remove garlic after a day or two. Shake well before using. Excellent on mixed salads, vegetables, meat or fish. Makes about 1½ cups.

WINE IN SOUP

When one contemplates wine in soup, one thinks at once of green-turtle soup, a dish fit to set before a king. What would it be without Sherry to flavor it, or to drink with it? Its near of kin, terrapin soup, its imitation, mock-turtle soup, are quite as dependent on Sherry. Just so, wine accents the subtle flavor of most soups, except those in which vegetables predominate. The use of wines in soups by French chefs in good restaurants makes one suspect magic. In clear soups, red wines taste best; in cream soups, dry white wines or Sherry. Just as the soup is served, good and hot but never boiling, put in a tablespoon of wine for each cup or dish. Always remember that this is a case in which too much spoils the broth.

The brief general directions just given must suffice for the many soups that housewives serve. There are a few special ones, however, which need more detailed instructions.

CLAM AND SHRIMP CHOWDER

2 large cans clam chowder	¼ teaspoon powdered marjoram
1 can wet shrimps	A few grains cayenne
Salt to taste	Worcestershire sauce
½ cup dry white wine	

Heat together the chowder and the shrimp cleaned and broken in pieces. Season well with salt, cayenne, and Worcestershire to taste. Just before serving, add the wine. This recipe should serve 6.

ONION SOUP

4 slices of bread toasted and cut in halves	4 tablespoons butter
6 medium onions, sliced	1 quart soup stock or bouillon
1 tablespoon flour	Grated cheese
	1 pint Claret or Burgundy

Sauté onions in butter until they are a golden brown. Then add a tablespoon of flour and stir until all lumps are crushed. Add the Claret or Burgundy, together with the soup stock, and simmer for twenty minutes. Do not let the soup boil after the wine is added. This recipe should serve 4.

BLACK BEAN SOUP

This soup, whether made at home or warmed up from a commercial can, is greatly improved by the addition of a tablespoon of Sherry to each dish. A little onion or celery salt improves the flavor. In addition to the usual slice of lemon and of hard-boiled egg, try a few pieces of alligator pear in each bowl.

OYSTERS IN SHERRY CREAM

Heat a cup of cream to the boiling point, add $\frac{1}{4}$ cup of Sherry and pour it into the baking dish. Put in 1 quart of oysters, drained. Let the oysters stand in the kitchen long enough to lose any chill from refrigeration. Spread the oysters evenly and sprinkle with salt and pepper. Over the top, scatter $\frac{1}{2}$ cup of coarse bread crumbs. Cook under the broiler just long enough to curl the edges of the oysters and brown the crumbs. Delicious for luncheon or supper.

WINE AND FISH

Few of the older American cookbooks (the author confesses he has read few) include wine in any of the many recipes they give for cooking fish, or for the sauces so indispensable to make most fish appetizing. Yet the French use wine in nearly all their ways of preparing fish for the table. What would the famous fillet of sole à la Marguery be without Sherry? Sauces for fish in French cookery always contain wine. The following is a good white wine sauce for fish. A dry white wine is the best flavormate for shell fish, though Sherry may be served.

WHITE WINE SAUCE FOR FRIED FISH

3 tablespoons butter	$\frac{1}{2}$ cup diced fresh tomatoes
1 green onion, minced	1 tablespoon lemon juice
$\frac{1}{2}$ teaspoon dry mustard	1 cup white dry wine
$\frac{1}{2}$ teaspoon sugar	Salt and pepper to taste
	1 tablespoon sweet pickle relish

In the butter sauté the chopped onion, including part of the green top. Add mustard, sugar, tomatoes, lemon juice, and wine, and season to taste with salt and pepper. Let simmer 15 to 20 minutes. Add sweet pickle relish, heat again, and serve. This recipe should serve from 4 to 6 people.

FISH BAKED IN WHITE WINE

2 pounds of fish, slices or fillets	2 sliced tomatoes, or 1 small can tomato sauce
1 large onion, sliced	
1 cup dry white wine	½ green pepper, sliced
3 tablespoons butter	2 teaspoons Worcestershire sauce

Sprinkle fish with salt and pepper and cover with the sliced onion. Pour wine over all and let soak for half an hour. Melt butter in large shallow baking pan. Remove fish and onion from wine and place in baking pan, cover with tomatoes and green pepper, and sprinkle with salt. Bake until fish is tender. Baste frequently with wine in which fish was soaked, mixed with Worcestershire sauce. Makes 4 large or 6 small servings.

CRAB OR LOBSTER NEWBURG

3 cups lobster or crab meat, cooked or canned	2 tablespoons brandy
½ cup butter	⅓ cup cream, heated
2 tablespoons Sherry	3 egg yolks, slightly beaten
	Few grains nutmeg

Salt to taste

Melt the butter, add the lobster or crabs, sliced, and cook 3 minutes. Add the Sherry and brandy, cook 1 minute, and add the cream. Season with nutmeg, salt and a little cayenne. Add the egg yolks and cook and stir gently until the sauce thickens slightly. Serve on toast triangles. This recipe should serve 8.

BAKED FISH FILLETS

Salt and pepper 8 small or 4 large fillets of sole or flounder, or thin slices of halibut, salmon, or other fish. Put together in pairs, sandwich style, with this stuffing:

3 cups bread crumbs	¼ cup melted margarine
¾ cup chopped celery	½ cup Sherry
3 tablespoons minced parsley	1 egg, beaten
Salt, pepper, and thyme to taste	

Place on greased pan and bake uncovered in hot oven 30 to 40 minutes, basting occasionally with Sherry and melted margarine. Serves 4.

OYSTER, SHRIMP, OR CLAM COCKTAIL SAUCE

⅔ cup catsup	1 tablespoon diced green pepper
⅓ cup Sherry	1 tablespoon minced onion
2 tablespoons vinegar	1 teaspoon Worcestershire sauce
1 tablespoon horseradish	Few drops tabasco sauce

Salt and pepper to taste

Mix ingredients and chill. Makes 1½ cups sauce, serving 8 to 10.

WINE WITH CHEESE

BAKED CHEESE SAVORY

7 slices bread (cut in 2-inch squares)	$\frac{1}{2}$ teaspoon salt
$\frac{1}{2}$ pound American cheese, sliced	$\frac{1}{4}$ teaspoon dry mustard
3 eggs, beaten	$2\frac{1}{4}$ cups milk
$\frac{1}{2}$ teaspoon paprika	$\frac{1}{4}$ cup Sherry

In a greased shallow baking dish arrange alternate layers of bread and sliced cheese. Beat eggs with paprika, salt, and mustard, add milk and wine, pour over bread and cheese. Bake slowly 1 hour. Serves 4.

SHERRY RAREBIT

1 pound American cheese	$\frac{1}{3}$ cup Sherry
$\frac{2}{3}$ cup evaporated milk	Hot toasted crackers

Cut cheese into cubes and place with evaporated milk in top of double boiler or in a chafing dish. Cook until cheese is melted. Stir in the Sherry slowly. Serve on crackers or toast. Serves 4.

CHEESE SNACK

With a fork mash 1 small package Roquefort cheese with a 3-oz. package cream cheese. Blend to a paste with Port or Sherry wine. Add a dash of cayenne. Use to stuff celery or as a spread for crackers.

WINE-ROQUEFORT DRESSING

1 small package Roquefort cheese	2 tablespoons Claret or Burgundy
$\frac{1}{4}$ cup salad oil	$\frac{1}{2}$ teaspoon Worcestershire sauce
2 tablespoons wine vinegar	Salt and black pepper to taste

Mash cheese with a fork, blend in oil, vinegar, and wine. Add seasonings to taste. Especially good on lettuce or mixed greens, tomatoes, or grapefruit. Makes a little over $\frac{1}{2}$ cup dressing, serving 3 or 4.

CHEESE SAUCE WITH WINE

Make a cream sauce with 2 tablespoons of butter, 2 tablespoons of flour, and a cup of milk. Add $\frac{3}{4}$ cup of cheese, cut small. Heat in a double boiler until the cheese melts. Season with salt and cayenne and add $\frac{1}{4}$ cup dry white wine just before serving. This sauce served on asparagus on toast, or poured over hard-boiled eggs, cut thin, makes a very good luncheon or supper dish.

WINE SAUCES

RED WINE SAUCE

The following recipe makes a delicious red wine sauce:

$\frac{1}{2}$ onion, chopped	1 tablespoon prepared mustard
1 tablespoon butter	1 teaspoon Worcestershire sauce
$\frac{1}{2}$ tablespoon flour, browned	$\frac{1}{2}$ cup bouillon
	$\frac{1}{2}$ cup Claret or Burgundy

Brown onion slowly in butter in saucepan. Add flour, mustard and Worcestershire sauce. Mix well, then add bouillon and stir until smooth. Blend in wine. Serve with roast or any red meat. Makes about 1 cup of sauce, or 6 servings.

ORANGE SAUCE

An orange sauce for game or lamb is made in accordance with this recipe:

6 tablespoons currant jelly	2 tablespoons orange juice
3 tablespoons sugar	2 tablespoons lemon juice
Grated rind 2 oranges	$\frac{1}{4}$ teaspoon salt
2 tablespoons Port wine	$\frac{1}{8}$ teaspoon cayenne

Beat the currant jelly with the sugar and orange rind for 5 minutes. Add the remaining ingredients and stir until well blended.

WINE SAUCE FOR GAME

Another wine sauce for game, venison, or lamb is made as follows:

1 tablespoon of butter	$\frac{1}{2}$ cup water
$\frac{1}{2}$ cup of currant jelly	$\frac{1}{2}$ cup sweet wine
Juice of $\frac{1}{2}$ lemon	3 cloves
A little cayenne pepper	Salt to taste

Bring to a boil all ingredients except the wine. Strain and add the wine and a little of the meat gravy.

PORT WINE SAUCE FOR VENISON

Cut venison steaks about $\frac{1}{2}$ inch thick. Salt, pepper the meat well and dip in olive oil. Broil from two to three minutes on each side over the hottest possible fire. The meat should be rare and served immediately on a large platter, pouring following sauce over the broiled venison.

Butter size of a walnut	1 tablespoonful currant jelly
$\frac{1}{4}$ teaspoonful salt	2 tablespoonfuls Port

Put above in saucepan, stirring until jelly is melted and ingredients mixed. Pour hot over the venison. This recipe serves two persons.

WINE FRENCH DRESSING

$\frac{1}{2}$ cup olive oil	$\frac{1}{4}$ cup red wine
1 teaspoon salt	$\frac{1}{4}$ teaspoon sugar
$\frac{1}{2}$ teaspoon pepper	

Put all the ingredients in a small covered jar. Before serving shake hard to blend well.

WINES IN MEATS

French pot-roasts and stews are all flavored with wine, usually a red wine, though the celebrated goulash of the Hungarians is made with white wine and a Port, Madeira, or some similar sweet wine. Chicken fricassee in continental European countries usually is prepared with a dry white wine and a little sweet wine.

POT-ROAST WITH WINE

Place roast in roasting pan, and cover it with lard, small piece of pork, and season. Brown roast in oven, add onions, carrots, celery, cloves and a pint of dry red wine. Add enough water to cover the roast. Let boil on top of stove, then put in oven and cook for five hours. Slice rather thick, using vegetables as garnish and pour gravy over meat slices.

KIDNEYS IN WHITE WINE

6 lamb kidneys	Pinch of pepper
2 tablespoons butter or drippings	1 bay leaf
$\frac{1}{4}$ teaspoon salt	1 teaspoon flour
$\frac{1}{2}$ cup white wine	

Wash kidneys, split and remove fat and membrane. Soak $\frac{1}{2}$ hour in salted water. Drain and dry. Place fat in skillet, when hot add sliced lamb kidneys, salt, pepper and bay leaf. Cook over hot flame, stirring constantly for 5 minutes. Sprinkle on flour, mixing well. Add wine and cook until thickened. Serve on toast. This recipe is enough for 3 people.

LAMB CHOPS WITH WINE SAUCE

Use heavy frying pan piping hot. Fry chops until done. Place on a platter. Pour off fat, add 2 wine glasses of Claret or Burgundy. Season with salt and pepper. Pour over meat and serve.

BEEF STEW

$\frac{1}{2}$ cup cooking oil	1 cup tomato sauce
1 pound diced beef	Salt, pepper
Garlic to taste	2 tablespoons flour
1 cup diced onions	Cloves, bay leaf, thyme
$\frac{1}{2}$ cup Claret or Burgundy	

Brown beef in oil placed in skillet. Add onions, and flavor lightly with garlic. Add flour, let brown, then add tomato sauce, season with salt and pepper and add $\frac{1}{2}$ cup wine. Then place little pieces of bay leaf, whole cloves and whole thyme in cloth sack and add to skillet. Cook until done, remove beef and boil sauce till thick.

TOMATO BEEF STEW WITH WINE

2 pounds beef stew meat, cut in 2-inch cubes	3 cloves
1½ cups Burgundy or Claret	1 bay leaf
Suet or cooking fat	3 small potatoes cut in halves
1 clove garlic, minced	1 pound tomatoes, peeled and quar- tered
1 cup diced celery	2 tablespoons browned flour

Add wine to beef cubes, and let stand 2 or 3 hours. Drain. Brown meat in hot fat. Season, and add garlic, celery, cloves, bay leaf. Add the wine in which the meat was marinated and enough water to cover the meat. Cover kettle and simmer for an hour. Add vegetables. Continue simmering until tender. Five minutes before serving, thicken with paste made of browned flour and a little water. Serves 6 to 8.

CHOPS BAKED IN WINE

Have lamb, pork, or veal chops cut about $\frac{3}{4}$ inch thick. Place chops in a deep bowl and cover with white table wine. Add a sliced clove of garlic or a minced onion. Weight down meat with a small plate to keep it covered with wine, and let stand in refrigerator several hours. Remove meat, drain, sprinkle with salt and pepper, roll in flour, and brown well in a small amount of hot shortening. Pour off fat from skillet, add the wine in which the chops were marinated, heat, pour over chops, and cover. Bake in a moderate oven for 45 minutes.

WINE ASPIC

When making meat aspic, use 1 cup hot water to dissolve contents of package of gelatin, then add 1 cup dry white wine. Just right for summer 'cold plate' meals.

VEAL CUTLETS, CLARET SAUCE

3 pounds veal cut in thin slices	Juice of 1 lemon
Salt and pepper	2 cups brown stock
1½ cups Claret	3 sprigs parsley
Flour	

Pound the veal until $\frac{1}{4}$ inch thick and cut in pieces for serving. Sprinkle with salt and pepper, put in a baking pan, pour on the Claret, and let stand 30 minutes. Drain, dip in flour, arrange in buttered pans, and pour on the remaining ingredients and the Claret which was drained from the meat. Cover and cook slowly until the meat is tender. Serve from the baking dish or remove the cutlets to a platter and pour the sauce over them.

CHICKEN WITH WINE

Have 2 young roasting chickens cut for serving, or use 3 fryers, quartered. Brown well in butter to which has been added a little olive oil. When well browned, pour $\frac{1}{2}$ cup of brandy over the chicken and light the brandy with a match. Add 2 cups of red wine, 6 small onions, peeled, 1 cup of mushroom caps, sliced, and $\frac{1}{4}$ cup of crumbled crisp bacon. Cover closely and simmer until chicken is tender (40 minutes or more). Remove to hot serving dish and sprinkle with chopped parsley and tiny croutons.

CHICKEN À LA KING

Heat chafing dish and add 3 tablespoons butter. Cook in the butter 1 diced pimento, 1 diced green pepper, 1 cup cooked or canned sliced mushrooms. Stir in $1\frac{1}{2}$ tablespoons flour, and season with $\frac{1}{4}$ teaspoon paprika, $\frac{1}{4}$ teaspoon pepper, 1 teaspoon salt. Stir continuously and add $1\frac{1}{2}$ cups light cream. Stir in 2 cups diced cooked chicken. Beat 2 egg yolks, add $\frac{1}{2}$ cup Sherry and stir into chicken mixture. Serve on toast. To make shrimp à la king, substitute shrimp for chicken and use other materials in same portions.

RISOTTO WITH PORK, CHICKEN LIVERS, OR CHICKEN

Grind pork or cut livers to the amount of 1 pound. Brown 1 cup rice in olive oil, then meat and lastly onions. When brown add tomatoes, touch of garlic, and season with salt, pepper, and 1 wine glass of dry white wine. Some meat stock may have to be used to cook the rice after browning.

LIVER AND ONIONS, ITALIAN STYLE

$\frac{1}{2}$ cup Claret or Burgundy wine	6 tablespoons oil or meat fryings
8 thin slices liver ($\frac{3}{4}$ to 1 pound)	4 medium onions, sliced

Add wine to sliced liver (calf, beef, lamb, or pork). Let stand in refrigerator an hour or longer, turning occasionally. About half an hour before serving time, fry sliced onions in part of fat until lightly browned. Remove and keep hot. Add remaining fat to skillet. Drain liver slices, roll in seasoned flour, brown quickly in same skillet, adding more fat if needed. (Allow about 10 minutes for cooking liver.) Take up and keep hot.

WINE FOR GAME BIRDS

Wine used in cooking pheasant, partridge, quail, or woodcock adds greatly to their flavor. For one of the larger or two of the smaller birds use the following recipe:

Place $\frac{1}{8}$ pound butter in a deep iron kettle. Dredge the bird lightly with flour, salt and black pepper. Brown well, then add $\frac{1}{2}$ cup hot water, cover and allow to simmer, stirring occasionally, adding a little water from time to time until bird is done. Add one wine glass of white wine or Claret. Cook until sauce is thickened. Pour over birds and serve.

WHEN ROASTING BIRDS

All birds, whether game or domestic, are greatly improved in flavor if basted with warm wine mixed with olive oil or melted butter. Use $\frac{1}{4}$ cup of any wine and $\frac{1}{4}$ cup of the oil or butter.

PORTERHOUSE STEAK AND WINE

2 pounds porterhouse 1 inch thick	1 onion
2 tablespoons butter	1 cup Claret or Burgundy
Salt and pepper to taste	

Sauté the steak until well browned on both sides. Season with salt and pepper. Add the wine, butter and onion. Allow to cook for 5 more minutes. Serve the remaining juice as a sauce over the steak.

TONGUE COOKED WITH WINE

1 fresh beef tongue	$\frac{1}{3}$ cup white dry wine
$\frac{1}{4}$ teaspoon thyme	$1\frac{1}{2}$ cups soup stock
1 bay leaf	3 tablespoons flour
6 peppercorns	$\frac{1}{4}$ cup chopped onion
2 tablespoons butter	1 egg yolk, well beaten
$\frac{1}{8}$ teaspoon white pepper	1 cup mushrooms
$\frac{1}{4}$ teaspoon mace	

Simmer tongue in salted water to cover, with thyme, bay leaf and peppercorns until tender. Sauté onions in butter, using high heat. Add flour, mace, pepper, stock and wine. Pour mixture over egg yolks, add mushrooms, and tongue. Continue cooking for fifteen minutes over a very low fire.

LEFT-OVER ROAST BEEF AND WINE

1 tablespoon butter	Salt and pepper
1 onion, chopped	Worcestershire sauce
1 tablespoon flour	$\frac{1}{2}$ cup Claret or Burgundy
1 cup bouillon	Thick slices of cold roast beef

Melt butter in frying pan and fry onion until golden brown. Blend in flour, mix well, then add bouillon and cook, stirring until blended. Season to taste. Add wine and continue stirring. Put in sliced roast beef and let heat slowly. If you have gravy left over from the night before, mix the wine with the gravy you already have, and add the meat. Serves 6.

WINE IN MEAT LOAF

$\frac{3}{4}$ pound ground beef, lamb, or veal	$1\frac{1}{4}$ teaspoons salt
$\frac{3}{4}$ cup rolled oats	$\frac{1}{4}$ teaspoon pepper
$\frac{1}{2}$ cup Burgundy or Claret	$\frac{1}{8}$ teaspoon poultry seasoning
3 tablespoons chopped onion	1 egg, beaten
2 tablespoons melted meat fryings	

Combine ingredients in order given. Pack into greased small loaf pan, and bake in moderate oven 1 hour. Serves 4 or 5.

WINE AND VEGETABLES

Wine can be used with few vegetables but there is at least one the author knows from experience which is made more appetizing when cooked with a white wine. About the most popular vegetable in Germany is sauerkraut, and at its best it always contains a generous amount of white wine.

The author has not tasted these dishes, nor can he find a recipe for them, but is sure that the German red cabbage with apples, and another red cabbage dish with chestnuts, are, or may be, prepared with a dry red wine.

SHERRY AND LIMA BEANS

2 strips bacon	2 tablespoons vinegar
1 chopped onion	$\frac{3}{4}$ cup Sherry
3 tablespoons brown sugar	4 cups drained cooked dry lima beans
2 tomatoes, diced	Salt and pepper to taste

Cut bacon fine and fry crisp, add chopped onion and fry until limp. Add brown sugar, diced tomatoes, and vinegar, and simmer 10 minutes. Add Sherry and beans, season to taste, heat thoroughly and serve. Serves 4 to 6.

DESSERTS AND WINES

All French cooks use wine generously in making puddings, pastries, sauces, and jellies. Plum pudding or mince pie would be tasteless without wine or brandy. A wine a little too poor to drink with pleasure can be used in any number of desserts, especially wine jellies. The following are but a few of the recipes found in American cookbooks, while French recipes for wine desserts occupy a large part of most of the cookbooks written in France.

CLARET SAUCE

1 cup sugar	1 cup Claret
$\frac{1}{2}$ cup water	Few grains nutmeg

Boil sugar and water together 5 minutes to make a syrup. Add the Claret and nutmeg and serve with any simple dessert.

FOAMY SAUCE

$\frac{1}{2}$ cup butter	1 egg, beaten
1 cup powdered sugar	2 tablespoons Sherry

Cream the butter, cream in the sugar, beat in the egg and add the Sherry, little by little. For a hot sauce, set over hot water in a double boiler and beat as the sauce thickens.

PORT WINE SAUCE

2 cups Port wine	1 cup brown sugar
2 tablespoons cornstarch	Salt and pepper

Heat the wine in a double boiler. Mix the cornstarch with the sugar and stir it into the wine. Cook and stir until the sauce is smooth and clear. Other red wines may be used in making this sauce.

SHERRY SAUCE

For a delicious Sherry Sauce, cream half a cup of butter thoroughly, gradually add one cup of confectioners' sugar, then very slowly add $\frac{1}{2}$ cup Sherry. The appearance and taste are improved if a little nutmeg is sprinkled on top.

SHERRY SAUCE FOR SPONGE PUDDING

3 eggs, yolks and whites beaten separately	1 cup flour
1 cup sugar	2 tablespoonfuls water
	2 tablespoonfuls baking powder
Season with salt	

Mix ingredients, place in deep bowl and steam for $\frac{3}{4}$ hour, then add 1 cup Sherry.

SHERRY HARD SAUCE

½ cup butter	2 cups powdered sugar
1 egg yolk	2 tablespoons Sherry

Stir the butter until creamy; work in the egg yolk and a cup of the sugar. Add the remaining sugar alternately with the Sherry. Beat thoroughly and chill before serving.

WINE SAUCE FOR PUDDINGS OR CAKES

Take 5 ounces of granulated sugar, 2 whole eggs and 3 yolks. Beat in mixing bowl, add the grated skins of a lemon and half an orange, the juice of one lemon and one orange, a little grated nutmeg.

Set the bowl in a hot water bath, beat constantly with a pint of Sauterne, or any dry white wine, until thick and frothy. Do not boil, as the eggs would curdle.

When done, add a dash of Sherry or brandy, and serve warm as sauce for puddings or cakes.

SHERRIED GINGERBREAD

Make your favorite gingerbread. While it is hot, sprinkle with Sherry. Cut in squares and serve with whipped cream, hard sauce, or canned pineapple slivers.

ZABAGLIONE

6 egg yolks	3 tablespoons sugar
6 tablespoons white sweet wine	

Put the egg yolks and the sugar in a cold double boiler top and beat until the mixture is thick and lemon-colored. An electric beater is just the thing for this recipe. Set the double boiler top in place over boiling water and continue beating hard as the Zabaglione cooks, adding the wine a little at a time. As soon as the mixture is just barely thick enough to begin to hold its shape, pour it out into heated pottery dishes. Serve with very simple crisp wafers.

BISCUIT TORTONI

2 eggs	½ teaspoon vanilla
2 cups heavy cream	2 tablespoons Sherry
½ cup powdered sugar	½ cup dried macaroon crumbs

Beat the egg yolks with the sugar until thick and lemon-colored. Add the vanilla and Sherry. Fold in the egg whites. Add the cream beaten until thick but not stiff. Gently stir in the macaroon crumbs. Pack into fluted paper cups and cover the tops with more macaroon crumbs. Set in the freezing compartment of the refrigerator. Serve in the cups.

PUMPKIN PIE WITH SHERRY SAUCE

3 eggs	1 ¼ cups cooked pumpkin
1 cup sugar	½ cup milk
1 tablespoon gelatin	½ teaspoon each, salt, ginger, nutmeg and cinnamon
¼ cup water	
	¼ cup Sherry

Beat the egg yolks with ½ cup of sugar and add the pumpkin, milk, and seasonings. Cook and stir in a double boiler until it thickens. Sprinkle the gelatin over the water in a cup and let it stand 5 minutes to soften. Then stir it into the pumpkin and set the mixture aside to cool. When it begins to thicken, fold in the egg whites, beaten stiff, with the remaining sugar. Add the Sherry, pour into a baked pie shell. Chill. Garnish with a thin layer of unsweetened whipped cream flavored to taste with Sherry. Arrange a row of jumbo pecan halves close to the edge.

FROZEN FRUIT PUDDING

1 pint milk	6 tablespoonfuls Sherry
1 quart cream	1 tablespoonful whiskey
1 ¼ cups sugar	3 tablespoonfuls Jamaica rum
½ cup water (hot)	1 tablespoon vanilla
2 eggs	Salt spoon of salt
2 tablespoonfuls gelatin	½ pound mixed candied fruits or
2 tablespoonfuls flour (heaping)	cherries

Wine in Cookery

Put milk on in double boiler; beat eggs, add sugar, salt and flour; add to milk and cook to thick custard. Take from fire, strain. Add gelatin previously dissolved in hot water. Set away to cool. When thoroughly cold add cream, liquor and fruit and freeze in ice cream freezer or refrigerator.

WINE JELLY

2 tablespoons granulated gelatin,	$\frac{1}{8}$ teaspoon salt
soaked in	$\frac{1}{3}$ cup orange juice
$\frac{1}{4}$ cup cold water	2 cups sweet wine
$\frac{1}{2}$ cup boiling water	$\frac{1}{2}$ cup Sherry
1 cup sugar	3 tablespoons lemon juice
	1 teaspoon grated lemon rind

Dissolve the gelatin in boiling water. Add the sugar, salt, wine, fruit juice and lemon rind. Stir well and let stand 10 minutes. Strain into a mould and chill. Serve with the meat course or as a dessert with thick cream and sponge cake. If you prefer a more delicate flavor, reduce the sweet wine to 1 cup and use $1\frac{1}{2}$ cups of boiling water.

RICE TUTTI FRUTTI

1 pint cream, whipped	$\frac{1}{2}$ dozen figs, cut in small pieces
$1\frac{1}{2}$ pints boiled rice (about 2 cups)	$\frac{1}{2}$ dozen preserved ginger, cut in
$\frac{1}{2}$ cup sugar	small pieces
$\frac{1}{4}$ package gelatin	1 wine glass Sherry

Soak gelatin in a little hot water until dissolved. Stir whipped cream and rice together, and strain gelatin into it. Add sugar, fruit and wine. Stir occasionally to keep fruit from settling until stiff. Put in mould, and serve with whipped cream, flavored and sweetened.

PURE GOLD JELLY

Soak two tablespoons unsweetened gelatin in half a cup cold water, then dissolve in one and a half cups of boiling water. Add one cup of granulated sugar, three tablespoons lemon juice and two cups white wine. Thoroughly strain and set to cool.

TUTTI-FRUTTI FROZEN PUDDING

$\frac{1}{2}$ cup seedless raisins	$\frac{1}{4}$ cup red wine
$\frac{1}{2}$ cup candied cherries	$\frac{1}{2}$ cup granulated sugar
2 eggs	$1\frac{1}{2}$ cups milk
	$\frac{1}{2}$ pint whipping cream, whipped

Grind raisins and cherries. Add wine, cover tightly, let stand overnight. Beat eggs and sugar until they are a light, lemon color. Add milk. Fold in whipped cream and wine-soaked fruit. Pour into freezing tray of electric refrigerator. Stir well every 30 minutes until mixture is completely frozen.

WINE JELLY

1 bottle red or white wine	$\frac{1}{4}$ cup cold water
1 cup Sherry	$\frac{3}{4}$ cup boiling water
1 $\frac{1}{4}$ pounds sugar	2 tablespoonfuls lemon juice
2 $\frac{1}{2}$ tablespoonfuls gelatin	Grated rind of $\frac{1}{2}$ lemon

Put gelatin in cold water. Dissolve 1 $\frac{1}{4}$ pounds sugar in wine, add lemon juice. Do not heat. Add grated rind of lemon, and gelatin to hot water to dissolve. When gelatin is dissolved stir into wine. Strain through two thicknesses of cheesecloth into moulds. Set in cold place to form.

WINE PLUM PUDDING

1 cup seedless raisins	$\frac{3}{4}$ cup sugar
1/2 cup diced candied orange and lemon peels	$\frac{1}{3}$ cup flour
1/2 cup diced citron	$\frac{1}{2}$ teaspoon salt
1/2 cup sliced candied cherries	$\frac{1}{2}$ teaspoon cloves
3/4 cup Sherry	1 teaspoon cinnamon
1 cup chopped kidney suet	1 teaspoon nutmeg
2 cups fine bread crumbs	1/2 cup chopped walnuts
	6 eggs, well beaten

Combine fruits, add Sherry and let stand overnight. Combine other ingredients in order given, add fruit-in-wine, mix well. Pour into one large ring mold or bowl, cover tightly. Set mold on rack in kettle; pour boiling water around it, letting water come up well on sides of mold; cover kettle and boil. Serve at once after 3 $\frac{1}{2}$ hours boiling, or cool and store in cold place until needed, then re-steam about an hour. Makes 12 to 16 servings. Serve hot, with creamy sauce or hot or cold wine sauce.

SHERRY AND GRAPEFRUIT HALVES

Cut grapefruit in halves, loosen fruit inside sections without cutting through section membranes. Pour off excess juice, then pour in enough Sherry to come level with the tops of the sections. Sugar to taste and serve chilled. Or cover each half with brown sugar, dot with $\frac{1}{2}$ teaspoon butter, place under broiler until lightly browned, and serve very hot. Tokay, Muscatel, or Angelica wine may replace Sherry in this recipe.

SHERRY GRAPEFRUIT MOLD

2 or 3 grapefruit	$\frac{1}{2}$ cup honey
2 tablespoons plain gelatin	Few grains salt
1/2 cup cold water	$\frac{3}{4}$ cup Sherry
2 cups boiling water-and-grapefruit juice	$\frac{1}{4}$ cup lemon juice

Pare grapefruit, removing outer membrane. Slip out sections, saving juice; add water to make 2 cups; heat to boiling. Soak gelatin in cold water 5 minutes, then dissolve in boiling water-and-grapefruit juice. Add rest of ingredients; cool. When mixture begins to stiffen, fold in grapefruit sections, pour into mold, chill. Serve as a salad, or for dessert. Serves 8 to 12.

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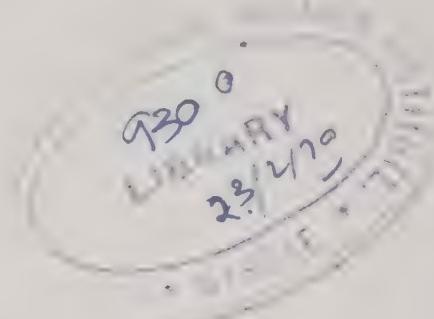
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